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34TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 135.

REPORT

ON THE

UNITED STATES AND MEXICAN BOUNDARY SURVEY,

MADE UNDER

THE DIRECTION OF THE SECRETARY OF THE INTERIOR,

BY

WILLIAM H. EMORY.

MAJOR FIRST CAVALRY AND UNITED STATES COMMISSIONER.

VOLUME I.

WASHINGTON:
CORNELIUS WENDELL, PRINTER.
1857.

IN THE HOUSE OF REPRESENTATIVES.

AUGUST 15, 1856.

Resolved, That there be printed, for distribution by the members of this House, ten thousand extra copies of Major Emory's Report on the Survey of the Boundary between the United States and Mexico.

Attest: WM. CULLOM, *Clerk.*

PART I.

MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES,

TRANSMITTING

A report of the survey of the boundary between the United States and the republic of Mexico.

AUGUST 4, 1856.—Laid upon the table and ordered to be printed.

WASHINGTON, *August* 1, 1856.

To the Senate and House of Representatives of the United States:

I communicate to Congress, herewith, the report of Major W. H. Emory, United States Commissioner, on the survey of the boundary between the United States and the republic of Mexico, referred to in the accompanying letter of this date from the Secretary of the Interior.

FRANKLIN PIERCE.

DEPARTMENT OF THE INTERIOR,
Washington, August 1, 1856.

SIR: I have the honor to submit to you, herewith, to be laid before Congress, a report of Major W. H. Emory, United States Commissioner, on the survey of the boundary between the United States and the republic of Mexico.

I am, sir, very respectfully, your obedient servant,

R. McCLELLAND.
Secretary.

The PRESIDENT OF THE UNITED STATES.

OFFICE UNITED STATES BOUNDARY COMMISSION,
Washington, July 29, 1856.

SIR: I have the honor to send herewith my report on the boundary between the United States and Mexico, together with proofs of such maps and illustrations as have been completed, numbered from 1 to 63. The plates and blocks from which these proofs are struck are held by me subject to your order, or that of Congress.

The general map cannot be completed until next winter, and the map of the new Territory is not quite completed, but when finished, no delay will ensue in the publication. By consultation with the printer, I find these maps will be done quite as soon as the printing of the report, should it be concluded to print that report.

Besides the volume now sent in, there will be an appendix, containing reports upon the botany and natural history of the country adjacent to the boundary, with from two to three hundred illustrations, many of which are already engraved and the plates deposited in this office. These reports are in the hands of Drs. Torrey, Engelmann, and Professor Baird, and other savans of the country. They promise to have them all finished in the course of the year. These reports not being of the same general interest, I concluded it was proper not to delay sending in the general report until their completion.

Should it be deemed proper to publish the general report and a limited number of copies of the appendix, I beg to call attention to my letter to you of April 23, 1856, by which it will be seen there is a large surplus of funds which may be made available for the purpose, and which has been saved from the appropriations made by Congress for the prosecution of the work. That surplus is at present more than $100,000.

I have the honor to be, your obedient servant,

W. H. EMORY,
United States Commissioner.

Hon. ROBERT MCCLELLAND,
Secretary of the Interior.

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* The peak represented in the wood cut as "Gomez Peak," is incorrectly named in the report—it is properly called "Mitre Peak."

ERRATA.

Page 4, line 37, for "steppes" read steps.

Page 24, line 17, for "Chas. Weiss" read John E. Weiss.

Page 24. The name C. B. R. Kennerly, surgeon, omitted, should come after J. E. Weiss.

Page 41, line 17, for "4,000" read 5,000.

Page 66, line 3, for "Los Adjuntas" read Las Adjuntas.

Page 70, line 21, for "Zocate" read Zoqueté.

Page 85, line 1, for "Beyonp" read Beyond.

Page 115, line 34, for "laid" read lay.

Page 120, line 19, for "present" read presents.

Page 121, line 30, for "Fonquiera" read Fouquiera.

Page 127, line 29, for "fluviatic" read fluviatile.

Page 128, line 41, for "Yumas" read Yuma.

Page 134, line 31, for "Pelatado" read Palotal.

Page 134, line 37, for "Samalurca" read Samalayurca.

Page 125, line 4, for "1,727.32" read 1,730.50.

Page 125, line 6, for "1,695.22" read 1,698.40.

Page 113, line 39, for "Manual" read Manuel.

Page 68, line 12, for "Islitas" read Islétas.

Page 123, line 17, for "Babuquivari" read Baboquivari.

Page 131. The distances from New San Diego to Fort Yuma were measured by Major N. W. Brown, paymaster U. S. A. Those from the Pacific ocean to the Gulf of Mexico, not otherwise designated, were measured under the direction of Lieut. N. Michler.

PREFATORY REMARKS.

The instructions given to me August 15, 1854, by the Hon. Robert McClelland, Secretary of the Interior, direct that, "in all cases where they do not conflict with the stipulations of the treaty, or the specific directions contained in these instructions, you will be guided by the instructions issued by the Department of State, and those of this department, to the Commissioner, for running and marking the boundary line under the treaty of Guadalupe Hidalgo."

The instructions referred to, given to one of my predecessors, and not repealed, directed an examination of the country contiguous to the line to ascertain its practicability for a railway route to the Pacific; and also directed information to be collected in reference to the agricultural and mineral resources, and such other subjects as would give a correct knowledge of the physical character of the country and its present occupants.

A compliance with these instructions has necessarily extended this report very much beyond the limits of the record necessary to show the official acts of the joint commission.

Fifteen thousand extra copies of this report have been ordered by Congress. It consists of two volumes, divided into four parts. The first part comprises the personal narrative; general description of the country; journal of the joint commission; the astronomical work; barometrical levels; meteorological record, and magnetic observations. The second part consists of the geological researches, with annotations, and a review of the whole by Professor James Hall. The third part comprises the general botanical features of the country, by Dr. John Torrey, described from memoirs of the assistants, and from the plants themselves, and a separte description of the cactaceæ, by Dr. George Engelmann, of St. Louis. The fourth part embraces the natural history of the country, by Spencer F. Baird, based upon the notes and memoirs by the assistants, and upon the specimens themselves.

The first two parts, forming volume I, are now presented to the government; the third and fourth parts, forming volume II, are delayed in consequence of the difficulty of getting the illustrations engraved.

Accompanying the first volume are five maps: first, a general map on a scale of $\frac{1}{6000000}$, and maps numbered from 1 to 4, on a scale of $\frac{1}{1000}$, showing the boundary line and topography of the country contiguous, as far as information has been obtained from actual survey or reconnoissance. If these maps were placed in the hands of department commanders, with directions to fill up the intervals not covered by actual survey, from the best information within their reach, which, from the numerous expeditions sent out under intelligent officers of the army, is very great, the government would be in possession of delineations of our whole southern frontier, more authentic in character than the maps of many of the old States.

I have confined myself in all these maps, except the general map, to actual information, derived from instrumental survey, and in doing so, have sacrificed considerable general interest which might have been given them had I incorporated all the loose information which exists

upon the subject; but I have considered that the time has come when hypothetical geography should cease, particularly when the graphic representation of a country is confided to the hands of officers of the United States army.

In all cases where I have used surveys other than those made under my orders, I have endeavored to give full credit to the officers by whom the labor was performed; and in cases where the work has been done under my own supervision, the name of each assistant has been given.

The system of borrowing, without acknowledgment, hitherto adopted, has tended very much to obscure and distort the history of the explorations and surveys of the western portion of the American continent, and has led Baron Humboldt into grave errors, and to commit personal injustice, when, in his Aspects of Nature, he attempts to present the progress of discovery in this region.

Besides the maps named in the preceding part of these remarks, fifty-four maps have been constructed, and are nearly completed, on a scale of $\frac{1}{60000}$, showing the boundary line in detail from the mouth of the Rio Bravo across the continent to where the line terminates on the Pacific ocean. These maps, to be signed jointly by the Mexican commissioner and myself, are to be deposited in the Department of the Interior, to form the official record of the boundary. They are too voluminous to admit of publication, and it is believed all the information which they contain is condensed in the five maps which are published.

Since the orders first given for this work, which contemplated, in addition, an exploration of a route for a railroad, a series of surveys have, by act of Congress, been organized under the War Department for the purpose of ascertaining the best railroad route to the Pacific ocean. All the information derived by the survey of the boundary line, including astronomical determinations, topography, and barometrical levels, have been placed at the disposal of the War Department in reference to its researches as to the routes for the railway. The thoroughness, completeness, and fairness, with which all these investigations have been conducted by the War Department, and the able manner in which all the reports and reconnoissances have been collated, have rendered it necessary for me to say but little of the practicability of the southern route, and have necessarily relieved me of the duties expected of me in this respect.

The reports from that department clearly demonstrate the practibility of a railroad route through the newly acquired territory, and go to confirm the opinion heretofore expressed by me, that it is the most practicable, if it is not the only feasible route, by which a railway can be carried across the "Sierra Nevada" and its equivalent ranges to the south.

In my report of the proceedings of the joint commission, I have omitted the correspondence which passed between the Mexican commissioner and myself, and our respective governments, upon the subject of paying the three millions of dollars, the balance of the indemnity due Mexico, and claimed by her representatives when the field-work of running and marking the boundary line was completed. That correspondence has already been printed by Congress, and will be found in Senate Ex. Doc. No. 57, 34th Congress, 1st session. It is sufficient for me to state here that I considered the claim of Mexico premature, and that the money should not be paid until the plans delineating the boundary were completed.

I conclude these remarks by appending extracts from the treaties defining the boundary between the United States and the republic of Mexico, and a copy of the commission conferring upon me the authority to run and mark the line.

Extract from treaty, dated Guadalupe Hidalgo, February 2, 1848.

ARTICLE V.

The boundary line between the two republics shall commence in the Gulf of Mexico, three leagues from land, opposite the mouth of the Rio Grande, otherwise called Rio Bravo del Norte, or opposite the mouth of its deepest branch, if it should have more than one branch emptying directly into the sea; from thence up the middle of that river, following the deepest channel, where it has more than one, to the point where it strikes the southern boundary of New Mexico; thence, westwardly, along the whole southern boundary of New Mexico (which runs north of the town called *Paso*) to its western termination; thence, northward, along the western line of New Mexico, until it intersects the first branch of the river Gila; (or if it should not intersect any branch of that river, then to the point on the said line nearest to such branch, and thence in a direct line to the same;) thence down the middle of the said branch and of the said river, until it empties into the Rio Colorado; thence across the Rio Colorado, following the division line between Upper and Lower California, to the Pacific ocean.

The southern and western limits of New Mexico, mentioned in this article, are those laid down in the map entitled "*Map of the United Mexican States, as organized and defined by various acts of the Congress of said republic, and constructed according to the best authorities. Revised edition. Published at New York, in* 1847, *by J. Disturnell.*" Of which map a copy is added to this treaty, bearing the signatures and seals of the undersigned plenipotentiaries. And, in order to preclude all difficulty in tracing upon the ground the limit separating Upper from Lower California, it is agreed that the said limit shall consist of a straight line drawn from the middle of the Rio Gila, where it unites with the Colorado, to a point on the coast of the Pacific ocean distant one marine league due south of the southernmost point of the port of San Diego, according to the plan of said port made in the year 1782 by Don Juan Pantoja, second sailingmaster of the Spanish fleet, and published at Madrid in the year 1802, in the Atlas to the voyage of the schooners *Sutil* and *Mexicana*, of which plan a copy is hereunto added, signed and sealed by the respective plenipotentiaries.

In order to designate the boundary line with due precision, upon authoritative maps, and to establish upon the ground landmarks which shall show the limits of both republics, as described in the present article, the two governments shall each appoint a commissioner and a surveyor, who, before the expiration of one year from the date of the exchange of ratifications of this treaty, shall meet at the port of San Diego, and proceed to run and mark the said boundary in its whole course to the mouth of the Rio Bravo del Norte. They shall keep journals and make out plans of their operations; and the result agreed upon by them shall be deemed a part of this treaty, and shall have the same force as if it were inserted therein. The two governments will amicably agree regarding what may be necessary to these persons, and also as to their respective escorts, should such be necessary.

The boundary line established by this article shall be religiously respected by each of the two republics, and no change shall ever be made therein, except by the express and free consent of both nations, lawfully given by the general government of each, in conformity with its own constitution.

Extract from treaty, dated City of Mexico, December 30, 1853.

ARTICLE I.

The Mexican republic agrees to designate the following as her true limits with the United States for the future: retaining the same dividing line between the two Californias as already defined and established, according to the 5th article of the treaty of Guadalupe Hidalgo, the limits between the two republics shall be as follows: Beginning in the Gulf of Mexico, three leagues from land, opposite the mouth of the Rio Grande, as provided in the 5th article of the treaty of Guadalupe Hidalgo; thence, as defined in the said article, up the middle of that river to the point where the parallel of * 31° 47′ north latitude crosses the same; thence due west one hundred miles; thence south to the parallel of 31° 20′ north latitude; thence along the said parallel of 31° 20′ to the 111th meridian of longitude west of Greenwich; thence in a straight line to a point on the Colorado river twenty English miles below the junction of the Gila and Colorado rivers; thence up the middle of the said river Colorado until it intersects the present line between the United States and Mexico.

* In the copy of the 4th article of this treaty, filed in the Department of State and published, this parallel is described as the parallel of 31° 47′ 30″; but it was so clearly an error of transcribing that the Mexican commissioner, with that good sense which characterized all his proceedings, agreed to ignore it. W. H. E.

PREPATORY REMARKS.

For the performance of this portion of the treaty, each of the two governments shall nominate one commissioner, to the end that, by common consent, the two thus nominated, having met in the city of Paso del Norte, three months after the exchange of the ratifications of this treaty, may proceed to survey and mark out upon the land the dividing line stipulated by this article, where it shall not have already been surveyed and established by the mixed commission, according to the treaty of Guadalupe, keeping a journal and making proper plans of their operations. For this purpose, if they should judge it necessary, the contracting parties shall be at liberty each to unite to its respective commissioner, scientific or other assistants, such as astronomers and surveyors, whose concurrence shall not be considered necessary for the settlement and ratification of a true line of division between the two republics; that line shall be alone established upon which the commissioners may fix, their consent in this particular being considered decisive and an integral part of this treaty, without necessity of ulterior ratification or approval, and without room for interpretation of any kind by either of the parties contracting.

The dividing line thus established shall, in all time, be faithfully respected by the two governments, without any variation therein, unless of the express and free consent of the two, given in conformity to the principles of the law of nations, and in accordance with the constitution of each country, respectively.

In consequence, the stipulation in the 5th article of the treaty of Guadalupe upon the boundary line therein described is no longer of any force, wherein it may conflict with that here established, the said line being considered annulled and abolished wherever it may not coincide with the present, and in the same manner remaining in full force where in accordance with the same.

ARTICLE II.

The government of Mexico hereby releases the United States from all liability on account of the obligations contained in the eleventh article of the treaty of Guadalupe Hidalgo; and the said article and the thirty-third article of the treaty of amity, commerce, and navigation between the United States of America and the United Mexican States concluded at Mexico, on the fifth day of April, 1831, are hereby abrogated.

FRANKLIN PIERCE, *President of the United States of America:*

To all who shall see these presents, greeting: Know ye, that, reposing special trust and confidence in the integrity, ability, and diligence of William H. Emory, of the District of Columbia, I do appoint him to be commissioner, on the part of the United States of America, to run the boundary line between the United States and the Mexican republic according to the treaty between the two nations entered into the 30th day of December, 1853, and do authorise and empower him to execute and fulfil the duties of that office according to law; and to have and to hold the said office, with all the powers, privileges, and emoluments thereunto legally appertaining unto him, the said William H. Emory, during the pleasure of the President of the United States for the time being.

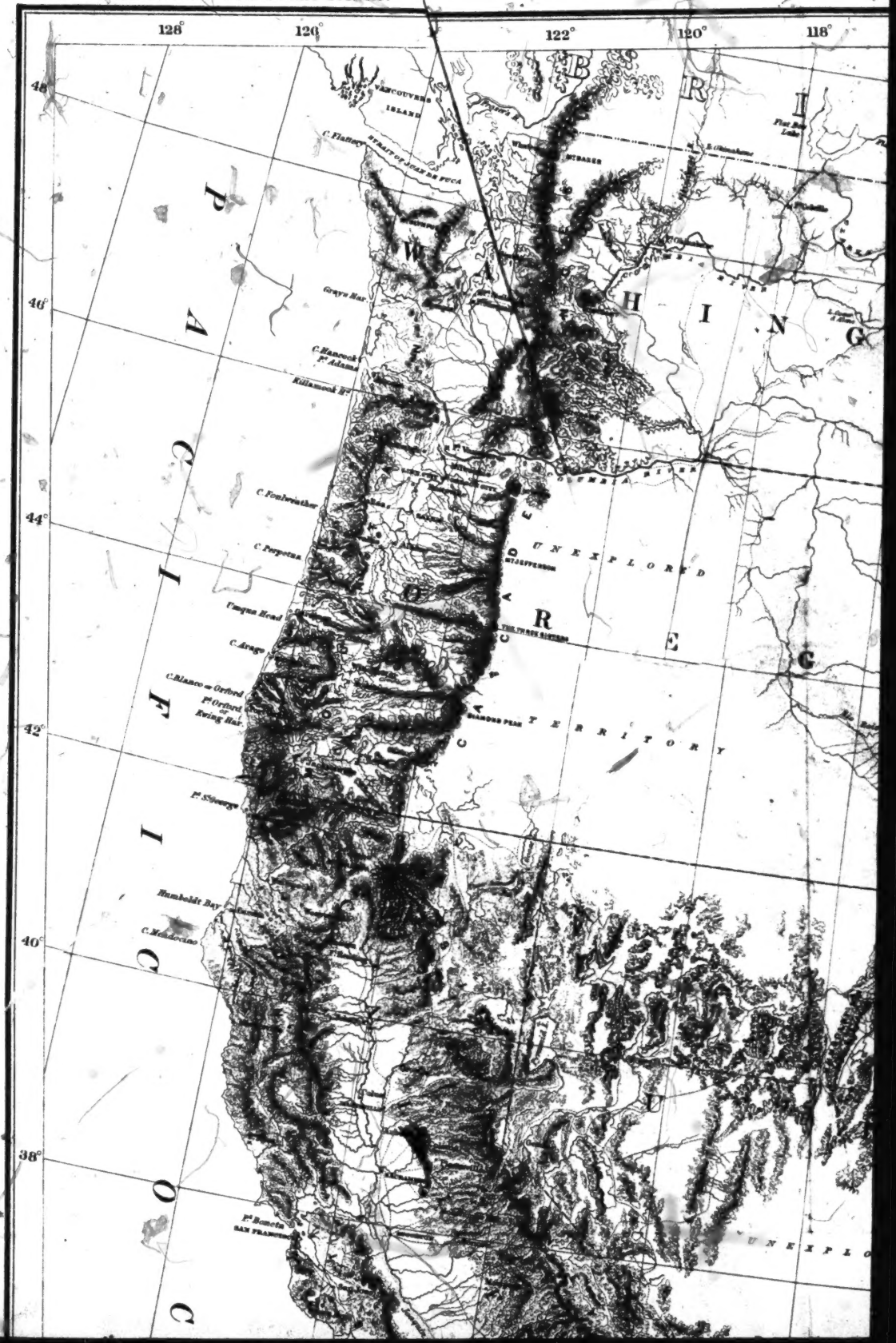
In testimony whereof, I have caused these letters to be made patent, and the seal of the Department of the Interior of the United States to be hereunto affixed. Given under my hand, at the city of Washington, the fourth [SEAL.] day of August, in the year of our Lord one thousand eight hundred and fifty-four, and of the independence of the United States of America the seventy-ninth.

FRANKLIN PIERCE.

By the President:

ROBERT McCLELLAND,
Secretary of the Interior.

UNITED STATES & MEXICAN BOUNDARY SURVEY.



118° 116° 114° 112° 110° 108° 106° 104° 102° 100° 98° 96° 94° 92° 90°

T I S H P O S S E S S I O N S

G T O N

O N

A

H

K A N S A S

M I S S O U

Milk River

Missouri River

Yellow Stone River

Big Horn River

Powder R.

Tongue R.

Big Cheyenne R.

White River

North Fork of Platte River

South Fork of Platte River

Nebraska or Platte River

Republican Fork

Arkansas River

Missouri R.

Yellow Stone R.

Milk R.

Judith R.

Musselshell R.

Marias R.

Teton R.

Sun R.

Dearborn R.

Maria's R.

Cut Bank R.

Two Medicine R.

Badger Cr.

Muddy Cr.

Box Elder Cr.

Porcupine Cr.

Rose Bud Cr.

Tullock's Fork

Clarks Fork

Wind River

Wind River Mts.

Big Horn Mts.

Black Hills

Laramie Mts.

Medicine Bow Mts.

Snowy Mts.

Little Missouri R.

Great Knife R.

Little Knife R.

Heart R.

Cannon Ball R.

Grand or Rec R.

Moreau or Owl R.

Chaun Cr.

Cheyenne R.

Running Water R.

Wild Rice R.

Sheyenne River

Maple River

Goose River

Turtle Mts.

Pembina Mts.

Devils Lake

Stony Lake

Rainy Lake

Lake Winnipeg

Lake Winnipeg R.

Lake Manitoba

Lake Winnipegosis

Swan Lake

Swan R.

Lake Traverse

Big Stone Lake

Red River

Minnesota R.

Crow Wing R.

Leaf R.

Long Prairie R.

Watab R.

Sauk R.

Elk R.

Rum R.

Mississippi R.

Des Moines River

Raccoon R.

Boyer R.

Little Sioux R.

Floyd R.

Big Sioux River

Vermillion R.

Jacques or Dakotah R.

James River

Turtle R.

Souris R.

Assiniboine River

Qu'Appelle R.

Saskatchewan

Elbow

Moose Jaw R.

Old Wives L.

Frenchman R.

Milk R.

Marias R.

Musselshell R.

Judith R.

Yellow Stone R.

Big Horn R.

Powder R.

Tongue R.

Big Cheyenne R.

White River

North Fork of Platte River

South Fork of Platte River

Nebraska or Platte River

Republican Fork

Arkansas River

Missouri R.

Yellow Stone R.

Milk R.

Judith R.

Musselshell R.

Marias R.

Teton R.

Sun R.

Dearborn R.

Maria's R.

Cut Bank R.

Two Medicine R.

Badger Cr.

Muddy Cr.

Box Elder Cr.

Porcupine Cr.

Rose Bud Cr.

Tullock's Fork

Clarks Fork

Wind River

Wind River Mts.

Big Horn Mts.

Black Hills

Laramie Mts.

Medicine Bow Mts.

Snowy Mts.

Little Missouri R.

Great Knife R.

Little Knife R.

Heart R.

Cannon Ball R.

Grand or Rec R.

Moreau or Owl R.

Chaun Cr.

Cheyenne R.

Running Water R.

Wild Rice R.

Sheyenne River

Maple River

Goose River

Turtle Mts.

Pembina Mts.

Devils Lake

Stony Lake

Rainy Lake

Lake Winnipeg

Lake Winnipeg R.

Lake Manitoba

Lake Winnipegosis

Swan Lake

Swan R.

Lake Traverse

Big Stone Lake

Red River

Minnesota R.

Crow Wing R.

Leaf R.

Long Prairie R.

Watab R.

Sauk R.

Elk R.

Rum R.

Mississippi R.

Des Moines River

Raccoon R.

Boyer R.

Little Sioux R.

Floyd R.

Big Sioux River

Vermillion R.

Jacques or Dakotah R.

James River

Turtle R.

Souris R.

Assiniboine River

Qu'Appelle R.

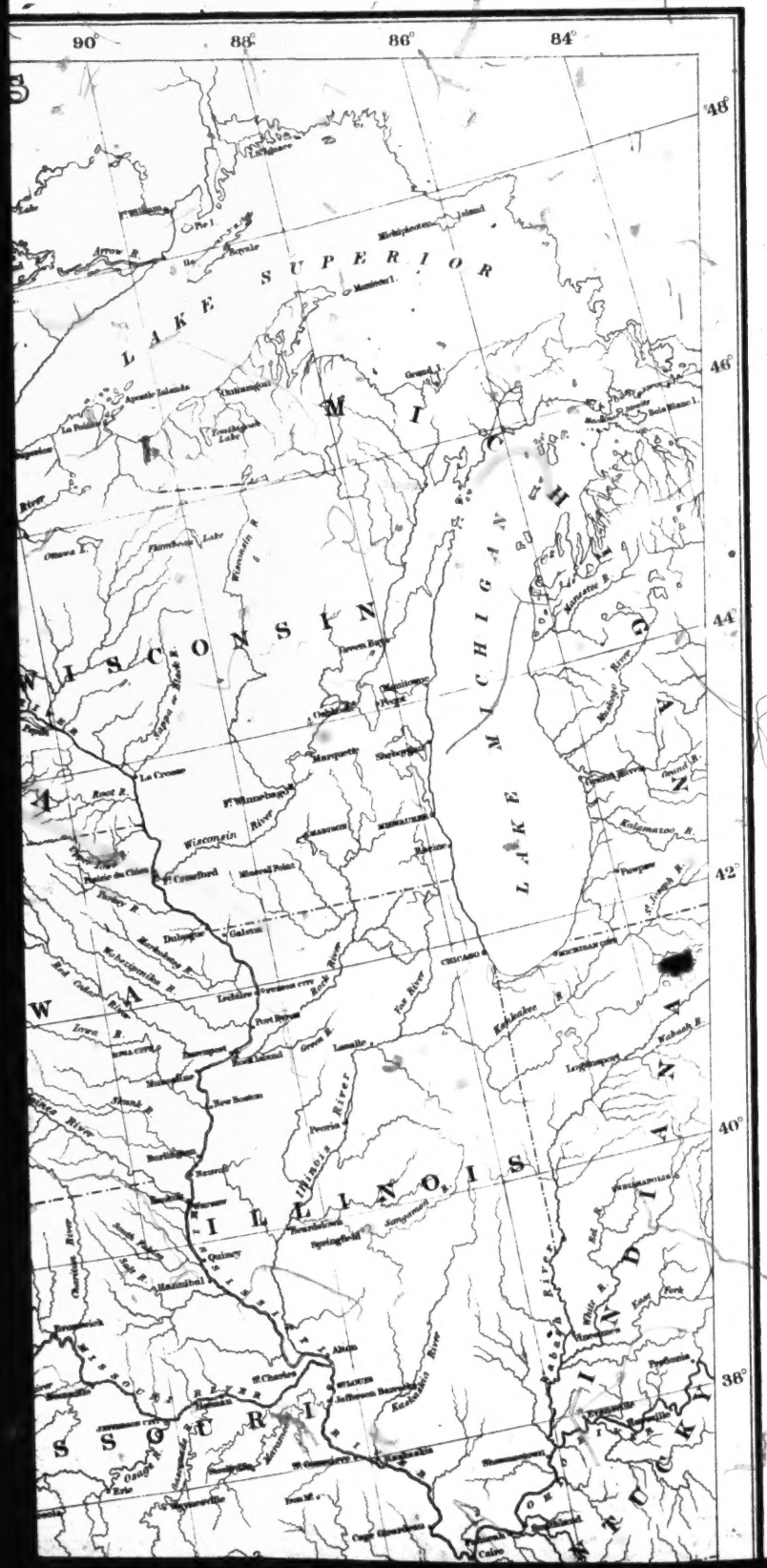
Saskatchewan

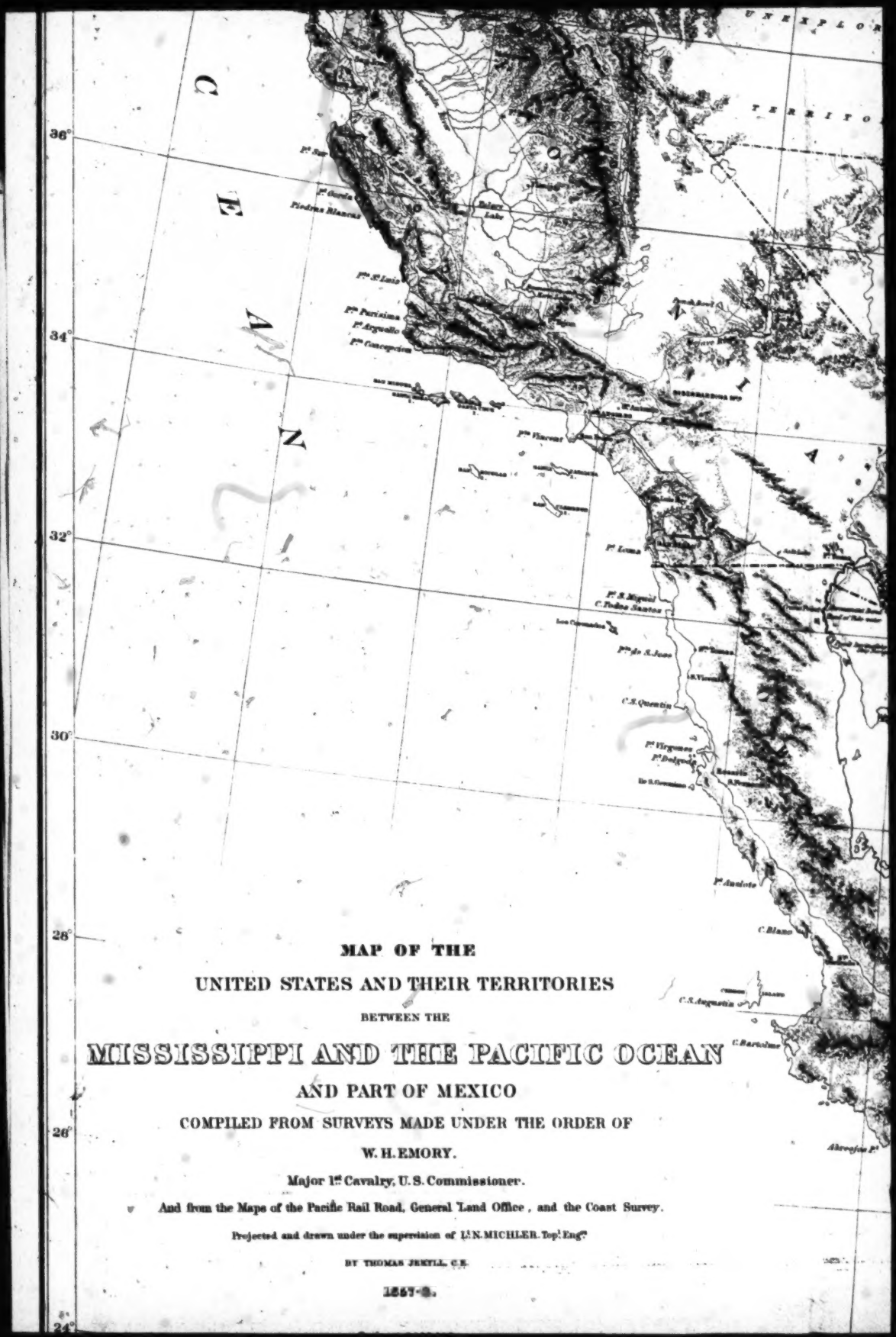
Elbow

Moose Jaw R.

Old Wives L.

Frenchman R.


90°
88°
86°
84°
48°
46°
44°
42°
40°
38°
LAKE SUPERIOR
MICHIGAN
LAKE MICHIGAN
WISCONSIN
ILLINOIS
INDIANA
KENTUCKY
Wisconsin River
Rock River
Illinois River
Wabash R.
Ohio R.
Mississippi R.
Chicago
Milwaukee
Detroit
Cairo



MAP OF THE

UNITED STATES AND THEIR TERRITORIES

BETWEEN THE

MISSISSIPPI AND THE PACIFIC OCEAN

AND PART OF MEXICO

COMPILED FROM SURVEYS MADE UNDER THE ORDER OF

W. H. EMORY.

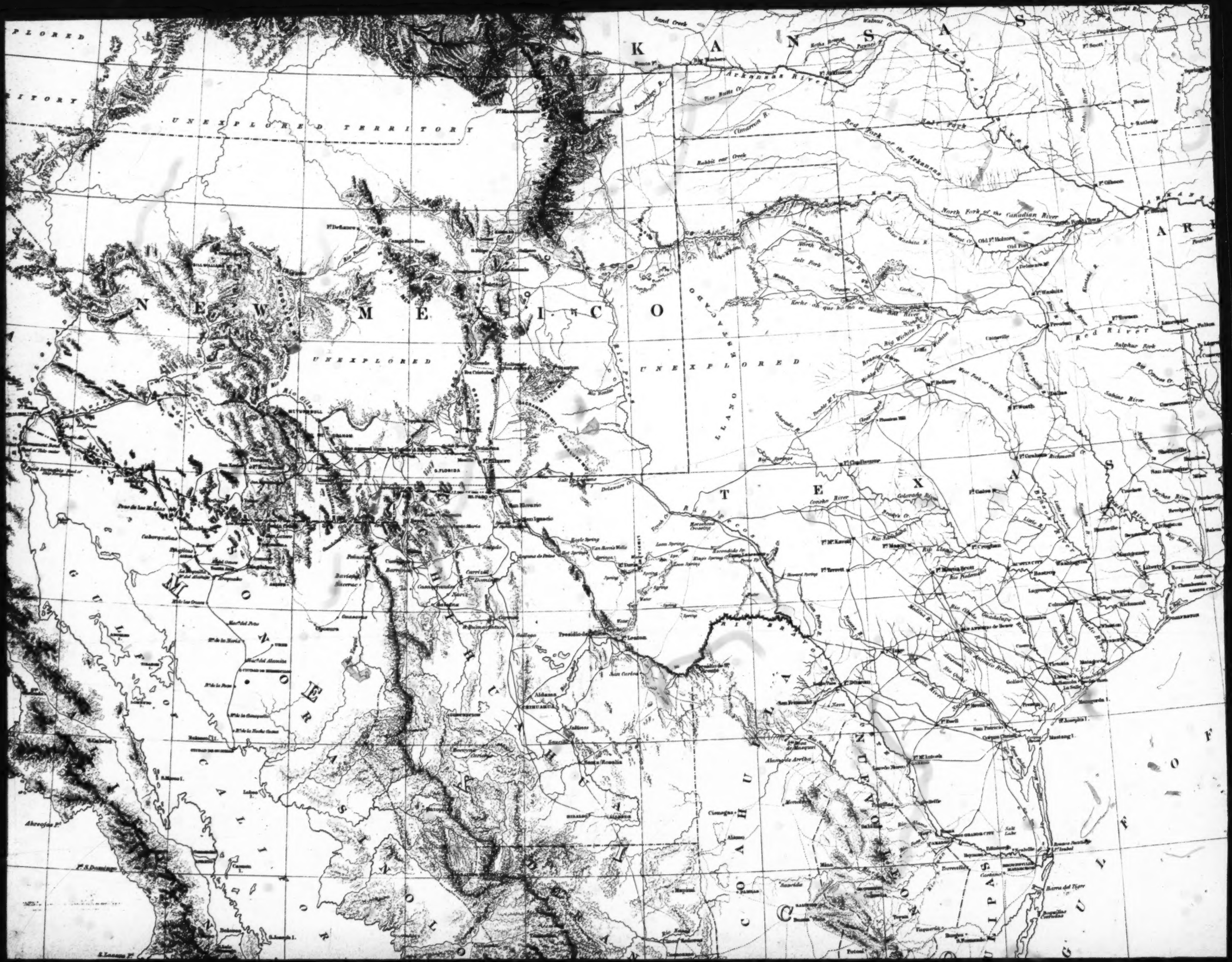
Major 1st Cavalry, U. S. Commissioner.

And from the Maps of the Pacific Rail Road, General Land Office, and the Coast Survey.

Projected and drawn under the supervision of Lt N. MICHLER. Topl Engr

BY THOMAS JEKYLL, C.E.

1857-8.


UNEXPLORED TERRITORY
K A N S A S
N E W M E X I C O
UNEXPLORED
UNEXPLORED
T E X A S
Arkansas River
Red River
North Fork of the Canadian River
Rio Grande
Colorado River
Brazos River
Rio Gila
Rio Puerco
Rio Pecos
Llano Estacado
Sierra Madre
Sierra Nevada
Sierra Verde
Gulf of California
Gulf of Mexico
Coahuila
Chihuahua
Durango
Zacatecas
Nuevo Leon
Tamaulipas
Sonora
Sinaloa
Mexico
Guanajuato
Queretaro
Hidalgo
Puebla
Vera Cruz
Tabasco
Yucatan
Oaxaca
Guerrero
Michoacan
Jalisco
Tepic
Colima
Old Fort Holmes
Fort Gibson
Fort Smith
Fort Towson
Fort Washita
Fort Arbuckle
Fort Belknap
Fort Chadbourne
Fort Graham
Fort Croghan
Fort Inge
Fort Lancaster
Fort Davis
Fort Bliss
Fort Fillmore
Fort Webster
Fort Thorn
Fort Conrad
Fort Craig
Fort Marcy
Fort Union
Fort Massachusetts
Fort Garland
Fort Massachusetts
Fort Defiance
Fort Wingate
Fort Tejon
Fort Yuma
Fort Mohave
Fort Leavenworth
Fort Scott
Fort Gibson
Fort Smith
Fort Towson
Fort Washita
Fort Arbuckle
Fort Belknap
Fort Chadbourne
Fort Graham
Fort Croghan
Fort Inge
Fort Lancaster
Fort Davis
Fort Bliss
Fort Fillmore
Fort Webster
Fort Thorn
Fort Conrad
Fort Craig
Fort Marcy
Fort Union
Fort Massachusetts
Fort Garland
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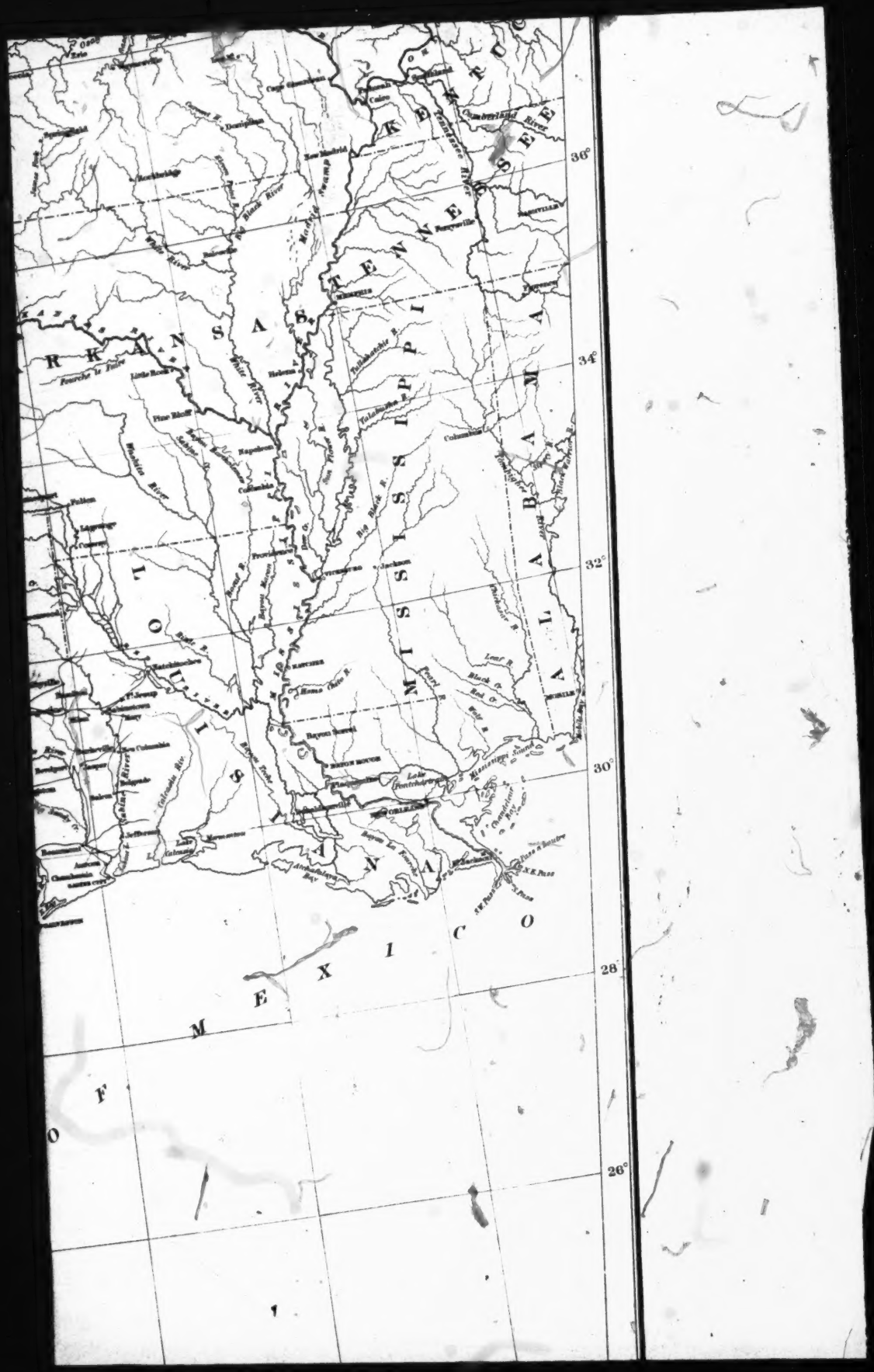
Fort Tejon
Fort Yuma
Fort Mohave


KENTUCKY
TENNESSEE
ARKANSAS
MISSISSIPPI
ALABAMA
LOUISIANA
MEXICO
GULF OF MEXICO
36°
34°
32°
30°
28°
26°

And from the Maps of the Pacific Rail Road, General Land Office, and the Coast Survey.

Projected and drawn under the supervision of Lt N. MICHLER. Topl Engr

BY THOMAS JEKYLL, C.E.

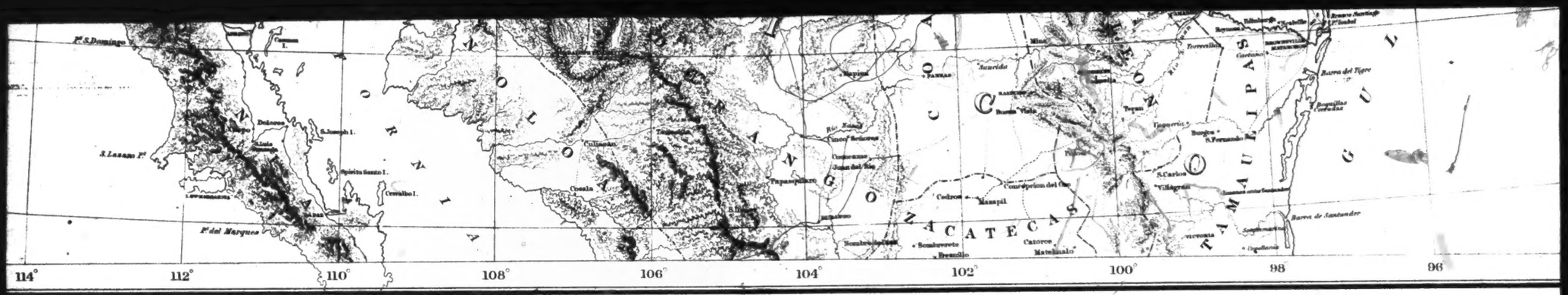
1857-8.

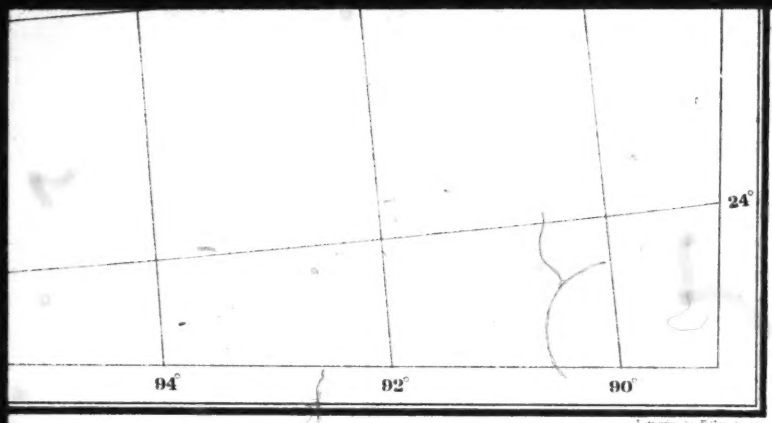
Scale 1:6.000.000

24°

122° 120° 118° 116° 114°

Engraved by Selmar Siebert


Pt. S. Domingo
S. Lazaro Pt.
Pt. del Marques
Cape St. Lucas
Dolores
Loreto
S. Joseph I.
Espiritu Santo I.
Cerralbo I.
Cosala
Culiacan
Durango
Mazapil
Catorce
Matehuala
Saltillo
Monterey
Parras
Saucillo
Presidio del Rio Grande
Rio Grande
Laredo
Camargo
Mier
Reynosa
Matamoros
Burro
Tampico
Tuspan
Tlacotalpan
Alvarado
Vera Cruz
Orizaba
Cordova
Jalapa
Perote
Puebla
Tehuacan
Oaxaca
Acapulco
Chilpancingo
Zacatula
Colima
Guadalajara
Tepic
Mazatlan
Rosario
Presidio del Norte
Monclova
Saltillo
Parras
Mapimi
Chihuahua
Paso del Norte
Janos
Fronteras
Arispe
Altar
Tubac
Tucson
Santa Cruz
Guaymas
Hermosillo
Ures
Alamos



Lettering by F. Courtenay

CHAPTER I.

PERSONAL ACCOUNT.

ORGANIZATION OF THE COMMISSION FOR RUNNING THE BOUNDARY LINE BETWEEN THE UNITED STATES AND THE REPUBLIC OF MEXICO, UNDER THE TREATY OF AUGUST, 1848.—CHANGES IN THE HEAD OF THE COMMISSION.—GOLD MANIA IN CALIFORNIA.—FAILURE OF THE GOVERNMENT TO KEEP ITS ENGAGEMENTS.—MISAPPLICATION OF THE PUBLIC MONEY.—GENERAL MISMANAGEMENT OF THE AFFAIRS OF THE COMMISSION.—FINAL REORGANIZATION.—CORRECTION OF STATEMENTS IN MR. BARTLETT'S NARRATIVE.

The narrative of the connexion which different individuals have had with the Boundary Commission would no doubt be instructive, but the commission organized under the treaty of Guadalupe Hidalgo was changed so frequently, and the controversies between different members of the commission were so acrimonious, as to make the task both complicated and unpleasant, and the execution of it might, perhaps, be attended with injustice.

I will, therefore, confine myself to such accounts as will enable the government, should occasion require it, to trace the history of the work, or any particular portion of it, and to the correction of some erroneous impressions which have gone abroad, not under authority of the government, but of books published as a private venture.

There have been two boundaries agreed upon with Mexico—that provided for in the treaty of Guadalupe Hidalgo, August, 1848, and that which now exists as the boundary, agreed upon in the city of Mexico, December 30, 1853, and usually known as the Gadsden treaty.

The treaty under which the first commission was organized required the appointment of a commissioner and surveyor, to run and mark the boundary from the Pacific to the Atlantic, a distance following the sinuosities of the boundary of several thousand miles, extending over a portion of the Continent but little known, and diversified with much variety of climate and topography, and infested throughout its whole extent with formidable and hostile bands of Indians.

I traversed a considerable portion of the line, in the campaign of 1846 and 1847, and made a reconnoissance of the country adjacent. The information obtained formed the basis of Mr. Buchanan's specific instructions to our minister in Mexico, in reference to the boundary, which instructions, unfortunately for the country, were not carried out.

It was, no doubt, from my supposed knowledge of the country that President Polk tendered me the office of commissioner, but attached the condition that I should resign from the army. This I respectfully declined. Colonel Weller was then appointed commissioner, and I was attached to the commission as chief astronomer and commander of the escort of United States troops, which was to accompany it.

The commission was organized on a moderate plan, and proceeded, according to the terms of the treaty, to commence at a point south of San Diego, on the Pacific side. The only way to get there was by Cape Horn or by the Isthmus of Panama. Most of the commission took the latter route, and reached Panama in March, 1849, expecting to meet one of the line of mail

steamers just established by the government. In this we were disappointed, and were kept in Panama, at great expense, until the middle of May.

Soon after the organization of the commission in Washington, and on the eve of departure, the news came of the discovery of fields of gold in California. This report set all "the wide awake" and unemployed men in the country in motion towards the new Eldorado, and it was with the greatest difficulty that passage to Chagres could be procured in the meanest craft. Every steamer and sailing vessel, without regard to sea-going qualities, that could be drawn from the regular channels of commerce, were put in requisition, and it was with considerable trouble that I procured a passage in the steamer Northerner, which sailed from New York.

Simultaneously with our arrival on the Isthmus, there was a precipitation upon it of all the odds and ends of the inhabitants of the Atlantic coast of North America and Europe. The state of Panama, with its mongrel race of Indians, negroes and Spaniards, with their intellects obfuscated by bigotry, and their bodies enervated by a tropical climate, was wholly unequal to the task of receiving and entertaining, in an orderly manner, such an influx of strangers. Fortunately, the mass of them was of the self-governing race of the whites of North America, and when disorder and confusion seemed inevitable, propriety resumed the sway, and a germ of civil liberty and self-government was planted for the first time in that mis-called republic, the fruits of which are now beginning to be made apparent in the new code of laws, and the extended and liberal views of some of her citizens; among whom stands conspicuously Señor Arosemena, to whose good offices we were indebted for a roof over our heads during our long delay in Panama.

It was estimated that as many as four thousand people were collected in Panama, awaiting transportation to California. The price of passage-tickets in the expected steamers rose to an exorbitant sum. Each person seemed to think that there was a limited supply of gold, and that his hopes of getting any portion of it depended upon his early arrival in the field. Panama, at that time fallen into decay, and her name, in fact, stricken from the list of commercial cities, was out of the highway of ships. Boats, something in shape and awkwardness like the "dug-outs" of the Mississippi, in use among the natives to transport fruit from the neighboring island of Toboga, were the only description of vessels that could then be obtained. The largest of them did not exceed ten or fifteen tons in capacity. Yet many were put in requisition to navigate the ocean over a space of three thousand miles, extending along a rock-bound coast, swept for a considerable portion of the way by adverse north winds. Many of the bold adventurers were wrecked, and few, if any, reached their destination in their frail barks, but were obliged to put in at Acapulco and other ports along the coast.

Seeing that there was little probability of our obtaining passage to San Diego before the middle of May, I unpacked the instruments, and set them up for the double purpose of practising my assistants and making observations at Panama for latitude and longitude, magnetic dip and intensity, and other phenomena, the results of which will be found elsewhere. The result of these observations threw much light on the geographical position and the climate of those tropical regions; but as the observations upon which they were founded were published in the fifth volume of the proceedings of the American Academy of Arts and Sciences, at Boston, it has not been considered necessary to reproduce them in this work.

When we arrived, in March, the summer or dry season was not ended, and the country was very healthy; but towards the latter end of April the rainy season set in, and with it came fever and cholera. Rejecting the sanitary precautions of abstemiousness usually resorted to in such

cases, I employed a good cook, and purchased light wines, and, by a generous diet, myself and companions escaped all disease, although we were out every clear night observing—at a time when it was thought certain death to the foreigner to expose himself. I learned this agreeable preventive treatment in Vera Cruz, which I twice visited when the vomito was raging—the last time under aggravating circumstances. Being engaged in embarking my regiment, which was encamped two miles from the city, I was obliged to make frequent visits to the latter both night and day, exposed alternately to the scorching sun and the evening dews; and although frequently passing through infected districts since, it was not until the autumn of 1853 that I suffered from this disease. I attribute the attack at that time to the fact of being kept on board a ship, where, by an unexpectedly long voyage of eighteen days from Brazos Santiago to Pensacola, we were reduced to salt junk and whiskey. With the system suffering under this diet, I incautiously visited Mobile, where the epidemic was very violent. In all places where this malady has prevailed, it is undoubtedly the case that those addicted to the use of salt meats, brandy, whiskey, and the stronger wines, Madeira and Sherry, are the most likely to suffer. And we may not see any important changes in the health of the southern coast of the United States until its inhabitants shall conform to the habits of tropical nations—discard rich, unctuous food, and all alcoholic drinks, and substitute pilaus and the light wines which can be produced in the mountains of the Carolinas and Georgia, but more particularly in the champagne country of Texas.

It was not until after the middle of May that a steamer appeared in the harbor, which proved to be the "Panama," one of the line of United States Pacific mail steamers, upon which I had shipped from New York the heaviest of the astronomical instruments intended for the boundary survey, in charge of Captain Hardcastle, corps Topographical Engineers.

The "Panama" was built before the discovery of gold in California, when it was supposed but very little would be carried by her except the United States mails and the government officers passing to California and Oregon. Her tonnage was, I think, something under 1,000 tons; yet such was the irresistible press for passage to California, that when she weighed anchor to proceed on her voyage, no less than seven hundred souls, exclusive of her crew, were found to be on board. Every reasonable effort was made by Capt. Bailey and other officers of the ship to administer to our comforts, yet the voyage was of the most disagreeable and unsatisfactory character.

The treaty with Mexico required that we should be in San Diego on or before the 31st of May. We arrived there on the 1st of June, but finding the Mexican commissioner had not come, we were at once satisfied that no evil would result from the unavoidable delay. On reaching San Diego we found the escort of troops awaiting us. It was composed of company "A," 1st dragoons, commanded by Lieut. Coutts, and company "H," 2d infantry, commanded by Capt. Hayden.

San Diego appeared to me not to have changed since 1846–'47. The news of the discovery of gold in the northern part of California, produced less commotion in that quiet town than in New York or Panama. Fortunately for us, it did not feel the effect until the reaction came from the Atlantic side, some months after our arrival. Had it been otherwise, all attempts to keep together the enlisted men and laborers of the survey would have been idle, and the commission would have been disorganized before doing anything.

The Mexican commissioner arrived July 3, at San Diego, accompanied by one hundred and fifty troops. The joint commission was organized on the 6th, and on the 9th I established my

observatory at the Punta, and called it Camp Riley, after the general then commanding in California, to whom we were much indebted for affording many facilities in conducting the survey. The infantry company was encamped in the valley near me, and the dragoons were sent up the valley of the Tia Juana, to a point where the grazing was good, to get in condition for the hard service upon which they were soon to be employed.

The following distribution was made of that portion of the officers and employés of the boundary commission under my direction: Aided by James Nooney and George C. Gardner, I took the personal charge of the determination of the latitude and longitude of Camp Riley, and the triangulation by which that determination was to be carried to the initial point on the Pacific; no convenient place for wood and water, which was at the same time protected from winds and the drifting sands, being nearer to the initial point than Camp Riley.

Lieut. A. W. Whipple, corps Topographical Engineers, assisted by Messrs. Parry and Ingraham, were assigned to the charge of the party to determine the other extremity of the straight line forming the boundary at the junction of the Gila and Colorado. In addition to his duties as assistant, Dr. Parry was charged with the geological and botanical investigations to illustrate the physical geography of the country.

Capt. E. L. F. Hardcastle, corps Topographical Engineers, assisted by Mr. George C. Gardner, and escorted by Lieut. Slaughter, with a detachment on foot, was placed in charge of the party to reconnoitre the country, gain a knowledge of the topography, and select elevated points by which the extremities of the line, or the two observatories in charge of Lieut. Whipple and myself, could be connected in longitude by flashes of gunpowder.

A party under the charge of the United States surveyor, assisted by Messrs. Whiting, Taylor, and Foster, were employed in surveying the shore-line of the head of the bay, for the purpose of showing on paper the initial point of the boundary on the coast of the Pacific, described in the treaty as being one marine league south of the port of San Diego.

The portion of the boundary which the commissioner designed to run first, consisted of a straight line from a point on the Pacific ocean, one marine league south of the port of San Diego, to the junction of the Gila and Colorado. The most obvious way of determining the direction of this line was to connect the two points by triangulation, and in this way ascertain their relative positions on the face of the earth, and compute the azimuth of the line joining them. But the character of the intervening country made it impossible to pursue this mode of operating, when the time and means at our disposal were considered. Triangulation is the most accurate, but the slowest and most expensive method of surveying, even in old settled countries, where the stations to be selected are easily accessible in wagons.

The peculiarities of this country presented obstacles almost insurmountable to such an operation. The whole distance, about 148 miles, may be divided into two nearly equal parts, differing in character, but both unfavorable to geodetic operations. The first, rising in steppes from the sea, devoid of water, and covered with spinous vegetation, attains in abrupt ascents the height of five or six thousand feet above the sea in the short distance of thirty miles. From this point, for about thirty miles more, the country is occupied by a succession of parallel ridges, striking the boundary nearly at right-angles, and separated by deep and sometimes impassable chasms. It then falls abruptly to near the level of the sea. The remainder of the line stretches across the desert of shifting sand at the head of the Gulf of California, destitute for the most part of both water and vegetation, rendering it impossible to mark the boundary in the usual manner on the ground.

At the various conferences of the joint commission, the mode of conducting the survey was discussed; and it was agreed to determine the line by astronomical methods, as the only mode by which we could do so correctly and within our means. Although not then a member of the joint commission, I was invited to their consultations; and my knowledge of the country, derived from a previous exploration, was brought into requisition.

I would here be doing injustice to Colonel Weller, the United States commissioner, and General Conde, the Mexican commissioner, if I did not place their conduct in contrast with what subsequently happened, by commending the just and enlarged views which guided their early conferences, and the intelligence and liberality with which all suggestions for the guidance of the scientific operations of the commission were received and adopted by those two gentlemen.

It will be seen by those conversant with geodetic matters, that the determination I had undertaken was of no ordinary kind, and required for its success the most accurate and elaborate observations, and a skilful application of those observations by analytic formulae, involving the figure of the earth and other elements, a perfect knowledge of which has not yet been attained, although researches upon the subject have occupied the minds of the great astronomers; and the last half century has seen their labors embodied, and our knowledge brought very near perfection, by the beautiful analysis of Bessel, and the successful application of that analysis by Professor A. D. Bache.

An error in the latitude or longitude of either extremity, of a few seconds, would produce a great departure of the line from the point it was intended to strike; the utmost precision was, therefore, necessary to be observed in all determinations connected with the line.

In this operation I looked for little or no aid from the Mexican commission, for although composed of well educated and scientific men, their instruments were radically defective. Our determinations, after being re-observed and re-computed by the Mexican commission, were received by them without correction; and the actual tracing of the line on the ground by the two parties, operating in different directions from the two extremities of the line, showed their correctness. When the parties met on the desert, they were found to be so nearly on the same line, that the difference might as properly be attributed to the inaccuracy of prolonging straight lines over such vast and almost impassable tracts, as to error in the original direction.

The elaborate observations and computations by which the result was arrived at, will be found in their proper place.

It was in the month of September, while engaged in this dreary and thankless work, that intelligence was received that Colonel Weller was removed, and Mr. J. C. Fremont was substituted. This official, although he accepted the appointment, afterwards declined it, and never joined the commission. At this time Colonel Weller was absent at the north, engaged in the fruitless task of raising funds. About the same time, intelligence reached our hitherto quiet and secluded camp, of the successful accumulation of wealth by many who had gone to the gold region without a dollar in their pockets. News came, too, that was afterwards confirmed, that Colonel Weller's drafts had been protested, his disbursements repudiated, and himself denounced as a defaulter; when, at that very time, as the settlement of his accounts afterwards showed, he was in advance to the government.

The wages of common laborers employed at the port of San Diego suddenly rose to $150 per month, and of carpenters to $10 per day. Subsistence of every kind rose in proportion; the

soldiers' rations from 20 cents to $1 50 per day. Our people had not been paid for some time, and we were without a dollar. This seemed more than poor human nature could bear, and one by one our force dropped off, until but four or five of the civil employés remained, and among them three persons in subordinate positions, whose fidelity, I think, deserves to be remembered—Francis Holley, Frank Stone, and my servant Robert, a slave.

I find no fault with any gentleman in civil life who left the commission at this time.

Had I not been an officer of the army in command of troops, and in charge of an important work co-operating with a foreign commission, I should have undoubtedly exercised the privilege of withdrawing. The government failed to comply with its obligations to pay the civil officers and employés their salaries, and even to supply them with the necessary subsistence. On the other hand, the field of gold was spread before them, and almost within their reach. I cannot say that any of the commission would have yielded to the temptation had those in authority been supplied with the means to pay them, or had they been invited to remain. As it was, I am not prepared to say that one left the commission without receiving and deserving an honorable discharge, and not a single member ever deserted the commission. I was at this time in a position of extreme embarrassment. It was a critical period in the progress of the work. All the preliminary steps had been taken; the observations nearly completed at one end of the line, and the party designed for the mouth of the Gila ready to start; the commissioner absent; without a dollar in my pocket; the commission dishonored at home, and without credit in the field. In this dilemma I did not hesitate to take the responsibility of using the military power in my hands to keep the work from being abandoned.

I directed the quartermaster and commissary of the army attached to the escort to furnish supplies and transportation, and I engaged to give each soldier, with the assent of his captain, when not on military duty, two dollars for each day's work done in running the boundary.

This arrangement, which was cordially approved by the commissioner, and subsequently, on a change of administration, by the government, worked well in more ways than one. While it supplied me with the manual labor necessary to carry on the work, it prevented desertion from the escort, which, in other branches of the army in California, occurred to an alarming extent; in some cases entire guards going off with their arms. Throughout the whole campaign we had but three desertions, and when I was relieved from the command I was complimented in orders from the commanding general of California for the successful manner in which the troops had been held together.

The outrage inflicted on the commission by withholding funds, and attempting to place at its head persons under influences avowedly hostile, so far from shaking my interest in the great scientific work which I had commenced, only increased my determination to complete it. At the same time I felt it my duty to resent the indignity, by tendering my resignation, to take effect on the completion of the line I had commenced, which was the only one indeed in the boundary, as then agreed upon, involving any very great degree of scientific skill. I accordingly wrote to the honorable Secretary of State the following letter:

CAMP RILEY, *September* 15, 1849.

SIR: * * * * * * * * * *

It is questionable in my mind whether the Department of State has followed up its intention, conveyed in the preliminary instructions of February 15. But if it has done so, and I am considered as occupying the position of chief astronomer and topographical engineer (of the boundary

commission,) I now desire, for reasons which, in my judgment, form an insurmountable obstacle to the proper performance of these duties, to be relieved from all duty on the commission.

I request the person may be designated to whom the instruments in my custody shall be turned over. They are at present distributed between Captain Hardcastle, Lieut. Whipple, Mr. A. B. Gray, and myself. In due season an account will be rendered of my astronomical determinations on this work, and the commission will be furnished with the result.

By the time of receiving my recall, I hope to have finished the determination of the astronomical line forming the boundary between the Pacific and the mouth of the Gila river, and it will be a convenient point for the transfer of the work to other hands.

* * * * * * * * * * *

I am, sir, very respectfully, your obedient servant,

W. H. EMORY.

In reply to this letter I received, almost simultaneously, the two following letters:

WASHINGTON, *November* 21, 1849.

SIR: Your letter of the 15th of September has been received. I learn from it with regret that you wish to be relieved from your duties as astronomer and topographical engineer, in connexion with the commission, on the part of the United States, for marking the boundary pursuant to the treaty of Guadalupe Hidalgo. Your claims and peculiar aptitude for that service were so generously acknowledged, that there was every reason to hope you might not be severed from the commission until the close of the business confided to it. Entertaining no doubt, however, that the reasons to which you allude are sound, and that the public will derive advantage from your employment in any other professional duty which may be assigned to you, your request is acceded to, and in a letter of this date I have requested the Secretary of War to designate your successor. In regard to the civil assistants to whom you refer, it is presumed that it would be best for them to remain, with a view to aid your successor in the discharge of his duties.

I am, sir, very respectfully, your obedient servant,

J. M. CLAYTON.

WASHINGTON, *November* 28, 1849.

SIR: The letter addressed to you by this department under date of 21st has been detained for the purpose of being sent by the officer whom the Secretary of War might appoint as your successor. It appears, however, from the communication of Mr. Crawford of this date, a copy of which is enclosed, that the order for your relief, which had been requested of him, would be so greatly inconvenient to the military service that he deems himself constrained to deny the request.

Under these circumstances, it is hoped that you will continue to discharge the duties of commander to the escort and chief astronomer to the commission, with the same fidelity and ability by which you have attained your high professional and personal character.

I am, sir, very respectfully, your obedient servant,

J. M. CLAYTON.

Major W. H. EMORY, *Astronomer, &c., &c.*

It might be supposed, after the receipt of these letters, that the desperate condition in which the affairs of the boundary commission had been left, by the neglect to supply it with funds,

had at last received the attention of the authorities at Washington, and that a brighter day was dawning on our work. Unfortunately for us, just after these letters were written, the work was transferred from the Department of State to the Department of the Interior, and these promising hopes were doomed to disappointment.

With the organization above described depending chiefly upon the military officers and escort attached to the commission, I completed the determination of the latitude and longitude of the two observatories near the extremities of the line, and proceeded to transfer, by triangulation, the determination of Camp Riley to the initial point on the Pacific. Although this was accomplished by a single triangle, the longest side of which was not five miles, such was the peculiarity of the atmosphere rendering objects near the coast indistinct, that I was nearly two months in completing this work satisfactorily. I had now lost nearly all my assistants, and the computation of the azimuth of the line and the tracing of the line on the face of the earth were done with no other aid than that of Captain Hardcastle and assistant Gardner and the infantry soldiers of the escort. Lieutenant Whipple, with the cavalry escort, was still at the junction of the Gila and Colorado, faithfully aided by the escort and assistants Parry and Ingraham.

In the mean time Colonel Weller had received official information that he was removed, and a successor, as before stated, was named who was to relieve him. His successor, however, never appeared, and things remained in a state of suspense until the receipt of the following letter:

DEPARTMENT OF THE INTERIOR,
Washington, January 8, 1850.

SIR: Mr. John B. Weller having been relieved from duty, as head of the commission to survey the boundary line between the United States and Mexico, and the direction of said commission having, therefore, fallen temporarily upon you, I have to request that the persons employed on the work may be reduced to the lowest number consistent with the proper though economical management of the business confided to you, by the discharge of all such as are not indispensable to the proper performance of the work, and whose services can therefore be dispensed with without detriment.

The number of surveyors ought not to exceed three; and in reducing the force you will have a view to the suggestions of Col. Abert to Lieut. Col. McClelland, a copy of which is enclosed.

I am, sir, very respectfully, your obedient servant,

T. EWING, *Secretary.*

Major W. H. EMORY, *San Diego, California.*

Upon the faith of these instructions, emanating, as they did, from the fountain-head of the authority of the government of the United States, I proceeded to reorganize the commission and make arrangements for the continuation of the survey of the line, and placed one efficient party in the field, under the charge of Capt. E. L. F. Hardcastle, and organized another to send by the most expeditious route to the Paso del Norte, on the Rio Grande, at which point it was agreed by the joint commission to meet in November of the same year, (1850.) A schedule of the reorganization and an application for funds, with an urgent letter showing our necessities, were sent and received by the Department of the Interior, and the following answer was returned:

DEPARTMENT OF THE INTERIOR,
Washington, April 10, 1850.

SIR: Your letter from San Diego, (without date,) enclosing papers marked 1 to 4, has been received.

The bill to supply deficiencies of appropriation for the present fiscal year, containing an appropriation for the boundary service, has passed the House and is now before the Senate, but will not probably be disposed of by that body in time to enable me to forward a remittance to you by the steamer which sails on the 13th instant. Funds will be sent to you, however, by the next departure from New York.

Your views as to the further prosecution of the work are generally approved, but you will receive more specific instructions by the next steamer; and you will in the mean time go on as you propose.

The monuments are in course of preparation, and will be sent as soon as practicable.

I am, sir, very respectfully, your obedient servant,

T. EWING, *Secretary.*

Major W. H. EMORY, *U. S. A., San Diego, California.*

Here is not only a distinct approval of my proceedings, but a promise that funds should be sent by the next steamer. Yet it will challenge belief when I state no money was sent, and the reorganization was practically repudiated by the appointment, for the second time, of a commissioner (Mr. J. R. Bartlett) to succeed Col. Weller, and new assistants were appointed, omitting all those appointed by me, under the authority and with the approbation of the Secretary himself.

To understand fully this extraordinary and inexplicable proceeding, and to give a comprehensive view of the gross injustice done not only to the individuals, but to the government, it must be borne in mind that we were co-operating with a foreign government in a great public undertaking, and that the few assistants who remained, faithfully performing their duties, did so at the sacrifice of going to the mines of California, where certain wealth awaited all who went at that time.

Congress also, with a just liberality which always characterizes it when legislating for those who are faithfully performing their duty, had voted $50,000 to pay the deficiencies due this very party. Not one cent of it was paid, as Congress designed, but it was improperly, if not illegally, diverted from its channel and given to the new commissioner, who expended it before he got on the ground, and incurred debts in addition far exceeding this sum. The persons for whom this money was intended, who had honorably sacrificed the certainty of private fortune to a sense of duty, were left in the field without pay and without subsistence.

It was hard to believe, and still harder to comprehend, that such an act of injustice could be perpetrated in a republican government. But when the fact became undoubted, and there was no longer hope, I called the small party together, and informed them that I should leave them to finish the line, as my instructions authorized me to do, in charge of a tried and faithful officer, Captain Hardcastle, and I would go to Washington in the first boat, to represent in person their situation. It was all that could be done in the case, and nothing else could be satisfactory after the clear breach of faith perpetrated twice, and in both instances, apparently, without the shadow of excuse.

On reaching Washington, I found a change had taken place in the office of Secretary of the Interior, and that the new Secretary, the Hon. A. H. H. Stuart, among the first acts of his administration, had sent relief to my party. By the aid of the means then furnished, the work was completed on the Pacific side, and the party returned to Washington in September, 1851.

Before leaving the Pacific coast, orders were sent me to turn over all the instruments, and the persons to whom they were turned over were directed to take them to El Paso, overland, by way of the junction of the Gila and Colorado.

The country to be traversed, as far as then known, was of the most difficult character, and almost impassable for wagons. The wages of teamsters and other laborers was $150 per month; mules, and all the means of subsistence, at a proportional price; and not a wagon was in the possession of the boundary commission. I reported all these facts, and showed the difficulty of complying with the order if we had funds; and, in addition to the natural obstacles interposed, it was well known there was not a cent in my hands; yet in the face of my remonstrances, the orders were reiterated, and, so far as my efforts went, were faithfully executed; but, as might be supposed, the persons who were charged with the performance of this duty utterly failed to accomplish it.

Foreseeing this result, and thinking it all-important that we should have a party on the ground in time to meet the commission at El Paso on the first Monday in November, the day on which they agreed to meet, and also that all the topographical information might be gained necessary to enable the commission to come to a proper decision on the point to be selected as the initial point of the boundary on the Rio Grande, I took the responsibility of ordering Lieutenant Whipple, with a suitable supply of instruments, to proceed to El Paso, by the way of Panama to New Orleans, and thence take the smooth road through Texas in wagons. But for this, the commission would have been at El Paso without an astronomical instrument, and without persons capable of using them, and wholly dependent upon the Mexican commission. A couple of weeks preceding my arrival from the Pacific, intelligence reached the department that the affairs of the new commission had fallen into great disorder at El Paso, and the Secretary of the Interior applied to the Department of War for me, by name, to be reassigned to the duty of astronomer, &c., to the boundary; but the intervention of the Bureau of Topographical Engineers caused another officer to be named in my place. I was quite satisfied to have nothing more to do with a mixed commission, governed by persons wholly unused to public affairs, and ignorant of the first principles of the scientific knowledge involved in the questions to be determined by them; but in little less than a year from this time, (September 13, 1851,) I was directed to proceed to El Paso and resume my duties, by taking charge of the survey of the boundary.

On the 15th I left Washington, and, after a dreary march across the prairies and uplands of Texas, reached El Paso in November, and resumed my duties in the field on the 25th of that month.

Having in view the difficulties of transportation over such a vast extent of country, uninhabited by civilized races, and infested by nomadic tribes of savages, I recommended, when in temporary charge of the commission, that the number of civil employés and assistants on the footing of officers should be reduced to fifteen. This recommendation was seemingly approved, yet on reaching the boundary commission I found that this number had been increased at one time to as many as one hundred and upwards; and although it had been greatly reduced, when I reached the scene of operations there were still a great many, the most of whom were unem-

ployed, and, with the exception of one or two, none were fitted for the service on which they were engaged; most of them ignorant of the first principles of surveying, and embroiled in feuds with each other, and arrayed in hostility either to the commissioner or to the head of the scientific corps.

The commissioner was absent on an expedition into Sonora, the commission was in debt, and not one cent was at my disposal to prosecute the survey. Beyond running an erroneous line a degree and a half west of the del Norte, and starting a party, with limited means, under Lieutenant Whipple, to survey the Gila, and another to survey the Rio del Norte from the point established by the commissioner, nothing had been done.

The situation was one of extreme embarrassment; but finding officers and men sufficient who were willing to undertake the work upon credit, I immediately established an observatory at Frontera, one at San Elceario, and another at Eagle Pass, and placed two surveying parties in the field in addition to those already out. In carrying out this design I was much aided by Mr. Magoffin, an influential and wealthy citizen residing near El Paso, with whom I had made the campaign in 1846, which resulted in the conquest of that country.

Clear and distinct representations were made of the condition of things to the Department of the Interior, and recommendations made to reduce and re-organize the commission which had been formed by the preceding administration on a scale preposterous in magnitude and absurd in principle. It was oppressed with a multitude of officers, quartermasters, commissaries, paymasters, agents, secretaries, sub-secretaries—all officers wholly unknown to any well regulated surveying corps, and worse than useless by the conflict of authority which these officers engendered, and the enormous expense which the payment of their salaries and personal expenses entailed on the commission.

The sum of five hundred thousand dollars had been expended, and I can safely say that not more than one hundred thousand had been appropriately used in running and marking the boundary up to that time, and all the work that could be said to be fairly accomplished was that done by the first commission—the completion of the line from the initial point on the Pacific to the junction of the Gila and Colorado rivers.

At the same time that I wrote a full account to the Department of the Interior of the condition of affairs in the field, and urged the necessity of immediate re-organization and relief in money, I despatched a special messenger, Mr. Edward Ingraham, with thirteen rifles, through the Indian country, in the direction of the Pimo villages on the Gila, to see if any intelligence could be had of the commissioner, with a letter to him representing in urgent terms the necessity for immediate aid. I entertained the reasonable expectation that from one or the other of these sources help would be obtained; and so believing, I did not hesitate to make all the necessary purchases to prosecute the work.

Although the Rio Bravo, from El Paso to its mouth, has been frequently mapped, it will surprise many to know, that up to the time when I commenced the survey, by far the largest portion of it had never been traversed by civilized man. This surprise will, however, cease when the reader reaches that part of the report which treats of the physical geography of the country, and his eye rests on the sketches by which it is illustrated. He will then see the impassable character of the river; walled in at places by stupendous rocky barriers, and escaping through chasms blocked up by huge rocks that have fallen from impending heights, where, if the traveller should chance to be caught in a freshet, inevitable destruction would be the consequence.

The plan adopted for the survey was to touch the river at convenient intervals, accessible to wagons, determine those points astronomically, establish depots for the surveying parties, and connect the intervening spaces by lineal survey. I attended in person to the astronomical work and the establishment of the depots. Lieutenant Michler, and assistants Von Hippel and Chandler, were placed in charge of the three surveying parties, and to their able assistance I am much indebted for the successful execution of the plan.

It would subserve no useful purpose to recite the difficulties which we encountered in the prosecution of this work. Superadded to the physical obstacles to be overcome, the men became almost insubordinate from the long absence of the commissioner from the work, and his unpardonable neglect to furnish money for their payment. Some of them had not received any pay for eighteen months, and the commissioner was at that moment, with an equipage and corps of attendants, visiting the States of Chihuahua and Sonora, and the Geysers of California—places sufficiently distant from the line.

When at Presidio del Norte, about one-third of the way down the river, the men, disgusted with long-deferred "promises to pay," became very mutinous; and on one occasion, I was obliged to put down a riot in my camp, single-handed, and at the risk of being shot by an insubordinate fellow, insane from the effects of the intoxicating mezcal. Shortly after, a whole party rebelled and refused to proceed further. Fortunately, at this moment I received, by an express sent out to intercept the mail from San Antonio to El Paso, an order from the Secretary of the Interior, authorizing me to draw on the department for a limited amount of funds. At this time, there was passing from Chihuahua to San Antonio a return merchant train with $5,000 in specie, which I obtained and turned over to the person acting as disbursing agent. With this sum I was enabled to pay off a portion of the men, and discharge the disaffected.

It was not until late in the fall of 1852 that we reached Eagle Pass (Fort Duncan) with the survey, having encountered no disaster, except the suspension of the work of Mr. Chandler's party, which was wrecked in the Cañon of the Rio Bravo, one hundred and twenty miles above the mouth of the Pecos. In the mean time, Mr. Michler's party had carried the survey from the mouth of the Pecos to Loredo.

At this stage of the work, just one year after my return to it, I received the first letter or notice of the commissioner, who sent me a check for twelve thousand dollars, which was handed over to Mr. Tansill, the disbursing agent, who, before he completed the negotiation of the note, received notice that it was dishonored. The work was, at the same time, inconvenienced by our receiving intelligence that the check for five thousand dollars was repudiated at Washington, which I had drawn upon the faith of the written order of the Secretary of the Interior, and which had been cashed by an unsuspecting and honest American merchant.

I considered that any attempt to push the work further, under the circumstances, was not called for on my part. The following letters were addressed to the commissioner, and all work was suspended except that of myself and personal assistants:

CAMP NEAR FORT DUNCAN, *October* 30, 1852.

SIR: I received your two checks—one for $12,000, the other for $8,000. The merchants here refused to cash them, alleging that similar drafts had been protested in Washington.

Unfortunately, a few days afterwards, notification was served on me, through one of the leading houses here, that a small draft drawn by me, under the authority of the Secretary of the

Interior, at Presidio del Norte, and without which the work would have been suspended at that point, had also been protested.

The protest was dated after the deficiency bill and the appropriation bill had become laws of the land. This settled the business. I had before this sent an agent to San Antonio to see what could be done, and unofficial advices are this day received, informing me the largest draft has fallen into hands of persons having, I know, large and just claims against the commission; so the whole object of my requisition, which was to have twenty thousand dollars here in cash to discharge and reorganize parties concentrating on this point, is defeated.

I made the requisition for that limited amount, supposing you, of course, would follow on immediately and join me here. Under these circumstances, seeing the work about to be suspended and myself placed in so false a position, I immediately, on the receipt of the notification that my draft was repudiated in Washington, despatched Lieutenant Michler to ascertain the cause, and correct, if possible, the delinquencies.

I have now been one year on this work without receiving a dollar from you, and have been obliged to sustain it by a system of credits, promises and threats, wholly unknown to our government. Considering the munificent appropriations made by Congress, I cannot think the survey has received anything like its just proportion of the funds.

I received by mail your letter informing me you could not keep your engagement to meet me at this place; in consequence of which I have this day made a requisition for funds directly on the Department of the Interior, to prevent, if possible, a suspension of the work, and the scenes of disorder that must ensue if the parties collecting here are detained for want of means to send them on or discharge them.

I regret to learn by your letter that you have taken Mr. Radziminski and assistants with you, as two opportunities presented themselves since your arrival, and that of Mr. Whipple, at El Paso, by either of which he and his party could have joined us with ease and safety.

I regret to learn, also, from Lieutenant Whipple, that you have not seen proper to furnish him with funds. I understood your letter as agreeing to my proposition that it was necessary to furnish with funds each chief of party.

So many and so complicated have become the difficulties growing out of the long continued absence of yourself, in whom rest all the moneyed powers of the commission, that I would, to obviate them and other difficulties, leave my work and go to any point to meet you; but your letter is indefinite both as to time and place of meeting, and, for the present, I content myself with sending this to the place you name as the most probable to meet you—Camargo, or rather Ringgold barracks, the American post opposite.

My estimate for the year 1852 was $90,000; not a cent too much, though many of the items in that estimate would, from my increased experience, now be changed. This estimate was made at El Paso in duplicate, accompanied by letter. One copy was directed to you at, I think, San Diego, and the other copy was directed to you through the Department of the Interior. If you were not in place to receive it, that is no fault of mine, and surely can never be used as a reason for the distressing and unusual condition in which I am placed, both personally and officially, by the total failure to keep the working people of this commission supplied with a portion of the munificent funds voted by Congress for this work.*

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* For a statement of all the money voted by Congress for this survey, see statement at the end of this chapter.

At El Paso, to avoid stopping the work, and to relieve the immediate necessities of individuals, I certified to the correctness of accounts, and the individuals sold them to shavers and brokers.

This necessity should never occur in government work, as it leads to speculation, and is injurious to the credit of the government.

Should this meet you, I desire you will send me, with as little delay as possible, twenty thousand dollars in cash, and cause thirty thousand to be placed to my credit either in New Orleans or at Fort Brown. Should you do so, the requisition on the government, if complied with, will not be used.

I am, sir, very respectfully, your obedient servant,

W. H. EMORY.

JOHN R. BARTLETT, Esq.,
United States Commissioner.

RINGGOLD BARRACKS, *December* 20, 1852.

SIR: The drafts drawn by me, under authority of the Secretary of the Interior, and the drafts sent me by you from El Paso, were all protested. Notice of this, and other circumstances beyond my control, caused me, in effect, to stop operations about the 5th of November, since which time I have been, as directed by the Secretary, awaiting your arrival; so that we have, in fact, been at work one year, without receiving a dollar from the government; and many of the employés have not been paid for a much longer time. As stated to you in conversation, at Presidio del Norte, a panic seized a large number of the men—first, with the idea that they never were to be paid, and, second, with a fear of the Indians.

Being in a country wholly remote from any aid, I found it absolutely necessary to keep the men in service; and upon the faith of orders from the department, and the expectation of soon meeting you, I promised they should be paid and discharged at Fort Duncan. I desire now to take the only remaining step left to enable me to redeem that pledge, and to request, if there is a dollar left, it may be distributed among these men.

Enclosed is a list of officers and men in the service, and the amounts due to each up to November 20, 1852. Subsequent revision of the accounts may show a slight alteration.

The total amount of this list is	$16,439
The pay, &c., up to this time will be, in addition	7,000
To which is to be added a check for $12,000 drawn by you in my favor, and turned over to T. W. Tansill, quartermaster of the boundary commission, accepted by Messrs. Lewis & Groesbeck, expended in drafts by Mr. Tansill, and subsequently repudiated by Messrs. Lewis & Groesbeck	12,000
There is also due, chiefly in San Antonio, about $8,000, the amount of the drafts drawn by me, under the authority of the Secretary, not accepted	8,000
	43,439

I think it unnecessary to make a requisition on you for a further prosecution of the work until the above demands are satisfied.

I am, sir, very respectfully, your obedient servant,

W. H. EMORY,

Bt. Maj. U. S. A., Chief Astronomer Survey B. C.

J. R. BARTLETT, Esq., *U. S. Commissioner.*

After making the best arrangements I could to satisfy the various demands of the men and other creditors of the commission, I repaired to Ringgold barracks, where it was reported the commissioner would strike the boundary on his return trip from Mexico. There I awaited his arrival, occupying my time by establishing an observatory, to be used in the event of the resumption of the work.

On the 20th of December the commissioner arrived; and finding that no security could be given for the payment of the debts already contracted, or for those necessary to be contracted in the future prosecution of the work, I did not hesitate to avail myself of the authority granted by the Secretary to suspend the work of the survey of the river. A resolution of Congress had already suspended the survey west of the river.

After turning over all the property and papers of the commission, except the instruments and notes of the survey, I repaired to Washington city, and commenced the computation of the field-work as far as it had been completed.

In the month of March, 1853, Congress appropriated a sum of money to complete the survey of so much of the Rio Bravo as constituted the boundary, and to prosecute the office-work of the survey. The commission was immediately reduced and reorganized. A new commissioner (being the fourth) was appointed.

The parties were organized by me, and placed in the field in less than a month; and by the middle of December, 1853, all the field-work was completed within the time and for a less amount than had been estimated.

The following is the organization under which the work of the old boundary was concluded:

Robt. B. Campbell, U. S. commissioner.
Lucius Campbell, secretary.
W. H. Emory, chief astronomer and surveyor.
G. C. Gardner, assistant.
J. H. Clark, do.
Lieut. Michler, corps Topographical Engineers, in charge of surveying party.
E. A. Phillips, assistant.
Ed. Ingraham, do.
Chas. Radziminski, in charge of surveying party.
Thos. W. Jones, assistant.
Jas. H. Houston, do.
Arthur Schott, in charge of surveying party.
M. Seaton, assistant.
J. E. Weiss, do.

Capt. George Thom, corps Topographical Engineers, was left in charge of the office-work, assisted by assistants Chandler, Herbst, Thom, Wheaton, and O'Donoghue.

The collation of the geological work was left in charge of Drs. Hall and Parry; that of the zoological, in charge of Prof. Baird; and the botanical, in charge of Prof. Torrey.

Lieut. Michler was assigned to the unfinished work above Eagle Pass, Schott to the survey from Laredo to Ringgold barracks, and assistant Radziminski to the survey from Ringgold barracks to the mouth of the Rio Bravo; whilst I, with assistants Gardner and Clark, determined astronomically the points along the boundary, intended as checks upon the accuracy of the surveys.

Before the completion of the work, the yellow fever made its appearance, and myself and several of the assistants were attacked—some on the line, and others after leaving it and reaching the northern shores of the Gulf of Mexico, where this disease raged with unusual violence.

No serious inconvenience was experienced, however, in the prosecution of the work, from this cause, and nothing happened to interrupt the harmonious and rapid execution of the field work, but the melancholy loss of assistant Thomas Walter Jones, who was drowned in the Rio Bravo by the upsetting of a skiff, in which he was returning to camp from his labors in the field, on the evening of 23d July, 1853. His body was found two days after, a few miles down the stream, and was buried by his afflicted companions at the rancheria of Dr. Merryman, on the banks of the Rio Bravo.

This ends the narrative of the operations in the field of the various commissions organized under the treaty of Guadalupe Hidalgo.

It is proper for me, however, before closing this chapter, to refer to a publication issued by Mr. J. R. Bartlett, one of the late commissioners on the part of the United States, which professes to give an accurate account of the affairs of the commission. It is not my purpose to review that work, and expose its errors, but simply to correct some statements affecting myself.

Mr. Bartlett's principal achievement on the boundary was the agreement with General Conde, the Mexican commissioner, fixing the initial point on the Rio Bravo, in the parallel of 32° 22′, instead of a point as laid down on the treaty map about eight miles above El Paso, which would have brought it to the parallel of 31° 52′. That agreement is no less remarkable than the adroitness and success with which Mr. Bartlett convinced the authorities at Washington of its correctness.

The question has been so thoroughly discussed, that a reproduction of it here is not called for. It is sufficient to say, that it was disapproved by the astronomer and surveyor on the commission at the time, and was finally repudiated by the government. Mr. Bartlett, in his account of the matter, states I was ordered to sign the map of his initial point, and that I did sign it. But he does not state what was the purport or meaning of my signature, nor does he give my letter which reported the circumstances to the government; but only an extract of that letter, selecting paragraphs of it to suit his own views. I here supply the deficiency by giving the letter in full, and the agreement signed by myself and Mr. Salazar, the Mexican commissioner, who succeeded General Conde. It will be seen that the Secretary of the Interior took the responsibility of making the action of the two commissioners final, thereby rendering the joint commission authorized by the treaty, as I understood it, a nullity. In view of such an interpretation, my signature as surveyor was only required, as alleged, to perfect the *official documents;* the words of the order were, "*You will sign the map of the initial point agreed upon by the two commissioners.*"

By reference to the treaty it will be seen that any agreement of the kind required the action of the joint commission, and that the joint commission was to be composed, not only of the *two* commissioners, but of the two surveyors also.

I refused to recognise the act as that of the joint commission, and signed the map as the order directed, carefully and studiously attaching a certificate that it was the initial point of the two *commissioners;* and to prevent the possibility of misconstruction, an agreement in writing was entered into with Mr. Salazar, and our signatures attested by witnesses, showing that the map was only that of the boundary agreed upon by the two commissioners, and nothing else.

This course, while it permitted me to obey a specific order in writing from a superior, left the government free to act, and repudiate the agreement by the two commissioners, as it subsequently did.

It is evident that any other course would have resulted in committing the government, irretrievably, to an erroneous determination of our southern boundary. It is but just, however, to Mr. Bartlett, to state, that so far as the facility for a route for a railway to the Pacific was considered, the line agreed to by him was no worse than that claimed by his adversaries. My own reports, based upon previous explorations, had presented the whole case very clearly to view. Yet these reports were overlooked, and it was ignorantly represented that while Mr. Bartlett's line lost the route for the railway, the other line secured it. I will not here fatigue the reader by a topographical description of the country, showing where the obstacles to a railway route exist; but he will see by a glance at the map, that the practicable route so adjudged by myself, and by other officers who retraced my steps and re-surveyed this country, is to the south of both these lines of boundary claimed under the treaty of Guadalupe Hidalgo.

In this same book, Mr. Bartlett claims to have produced the first correct map of the Gila. He labors to place himself on the footing of an explorer of a new country, and only mentions previous explorers of that river to repudiate them.

On page 192, volume II, Mr. Bartlett, in his personal narrative, says: "It is also proper to state, that Lieutenant Whipple and Mr. Gray found the bend of the river to be much greater than is laid down by Major Emory on his map." It would have been no more than truth required, for Mr. Bartlett to have stated, what I expressly state in my printed memoir accompanying this map, that I did not explore this bend, but laid it down from conjecture. It is a small affair, subtended by a chord of thirty or forty miles. I passed over the chord, and not the bend, and so stated.

The survey of that bend is given in the map of this report, and it will be seen it differs from that laid down by Mr. Bartlett as the first correct map of the Gila. A comparison of his map with that published by me in 1846 will show that, with the exception of this bend, which he has laid down erroneously, he has copied literally my map of 1846, even those parts laid down conjecturally.

The reconnoissance of the Gila made by me in 1846 was under adverse circumstances, made, I may say, in the face of the enemy; yet it has stood the test of re-survey, and Mr. Bartlett has added to the injustice of attempting to depreciate my labors, the meanness of appropriating them.

On the same page, and in the same spirit, Mr. Bartlett says: "Mr. Gray, in his official letter to the Secretary of the Interior, from San Diego, says that many errors of others who have been along this river, in astronomical observations, were corrected by Lieutenant Whipple."

As I am the only person who ever made an astronomical observation on the Gila, previous to

my sending Lieutenant Whipple there, who was one of my assistants on the boundary, I am the person referred to.

The points selected by him, and those selected by me in 1846, are not identical, and no survey connected them; they therefore, as a general rule, cannot be compared directly with each other. Fortunately, however, the only point determined elaborately by Mr. Whipple can be placed in direct comparison with my reconnoissance in 1846. By reference to my journal, published by Congress in 1847, it will be seen I observed with the sextant, in 1846, at a camp about one mile and a half south of the junction of the Gila and Colorado, and obtained for the—

Latitude of the camp	32° 44′ 09″
Longitude west of Greenwich	7ʰ 38ᵐ 28ˢ.6

Lieutenant Whipple, under my orders, determined the junction with a 36-inch transit, and a 46-inch zenith telescope, to be in—

Latitude	32° 43′ 32″.3
Longitude	7ʰ 38ᵐ 11ˢ.8

Upon this determination of Lieutenant Whipple's being recomputed by Professor Hubbard and myself, introducing the new element of the corresponding observations at Greenwich, furnished by Professor Airy, we obtained—

For latitude	32° 43′ 23″.3
For longitude	7ʰ 38ᵐ 24ˢ.27

Now, if we make allowance for this mile and a half, which was not accurately measured, we find a coincidence in the two results truly remarkable, considering that I used, in 1846, only a reconnoitring instrument, a small Gambey sextant.

The above will show that Mr. Bartlett had no authority, in fact, for what he states; and to show, further, that he has given currency to an insinuation neither justified by facts nor by reliable information within his reach, I give the following letter of Lieutenant Whipple, who made the re-survey of the Gila, and who is the only person from whom Mr. Bartlett could derive his information:

WASHINGTON, *June* 13, 1853.

DEAR SIR: Your note of this date communicates a paragraph from "Bartlett's Personal Narrative," stating that Mr. Gray, in his official letter to the Secretary of the Interior, from San Diego, relating to the survey of the Gila, says, "that many errors of others who have been along this river, in astronomical observations, were corrected by Lieut. Whipple."

If the above was intended, as you infer, to throw discredit on your astronomical labors in 1846, I do not hesitate to pronounce it unjust. *During the progress of the survey and afterwards*, I freely expressed my admiration of the general precision with which the Gila had been laid down upon the map from your astronomical observations.

I am, very respectfully, your obedient servant,

A. W. WHIPPLE.

CAMP NEAR FORT DUNCAN, *October* 1, 1852.

SIR: I have the honor to acknowledge this day the receipt of your letter enclosing me the commission of United States surveyor, for running and marking the line between the United States and the republic of Mexico.

Your letter enclosing the appointment was handed me on the 30th of January at Samalurca, in Mexico, together with a letter of instructions, and a copy of instructions to the commissioner, dated November 4, defining the duties of the surveyor, and directing me to be governed accordingly.

I have been hoping from that day to this to have an interview with the United States commissioner, but have not, in consequence of his absence, nor have I received any communication from him whatever, until the day on which I broke up my camp at the Presidio del Nörte, August 20. I received by express a letter from him, a copy of which is herewith enclosed, by which it will be seen he arrived at El Paso on the 16th of August, and proposed to meet me at this place.

There are several points in these instructions, based, as I have reason to believe, upon erroneous information conveyed to the Secretary; and as I believe the commissioner to whom they refer as directly as to myself will concur with me in the recommendation I design making, I have, for obvious reasons, deferred making them until his arrival, and shall defer doing so with the hope of at length meeting him. In the mean time I have pushed the survey with unceasing diligence and economy; and many subjects now press so closely, that it is necessary for me to communicate directly with the Secretary, and no longer await the arrival of the commissioner.

I have carried the survey down as far as Laredo, with the exception of a small space still to be covered between the great Chiso Cañon and the Rio San Pedro. On this portion two parties are now operating. One was disbanded and reorganized by me in consequence of a panic which seized it in regard to the Indians; and the other has within these last few days been surrounded by Indians, forced to abandon the survey, retire to the hills, and send in for aid.

To the first I was obliged to give the entire escort, and pass through the infested country myself without a soldier; to the last I gave all the spare men I had; and it was also furnished, at my request, by Major Lamotte, commanding at Las Moras, with five infantry soldiers. This region is the thoroughfare for all the bad Indians on the frontiers. I have passed through it myself without damage, and I hope the two parties will do the same; but enough has happened to justify me in having in previous communications so often urged the necessity of additional escort, and I have now respectfully to request that the Secretary will apply to the War Department to furnish a company of soldiers to escort either of these parties should they be again driven back; below here no escort will be required.

The parties have each been so well reinforced, I do not believe either of them will have any further trouble, for all work bravely and cheerfully; but if they should, it would cause much delay unless a company of soldiers is held in hand to send them.

On my reaching the ground to take charge of the survey, November, 1851, I found that Mr. Bartlett and the acting surveyor had agreed upon the initial point, 32° 22', and that a great stone monument had been erected marking the point, and having the usual inscriptions, and the names of the American and Mexican commissioners, astronomers, and surveyors; and Mr. Salazar informed me this had been hastened at the urgent request of the American astronomer and surveyor.

I also found that articles of agreement, based upon the letters of instruction from the commissioner to Col. Graham, my successor and predecessor as chief astronomer, had been entered into with Mr. Saldzar for the survey of the boundary, and the survey had been commenced at the initial point, 32° 22', by Col. Graham.

On the 30th January, 1852, while on my route west of El Paso, in pursuit of the commissioner, I received unexpectedly, and certainly unsolicited, the letter of appointment as United States surveyor, and your letters of instructions, one to myself and a copy of the letter of instructions to Mr. Bartlett, dated November 4, 1851, in which it is directed that "should the surveyor at any time differ with you [the commissioner] on any question connected with the survey, he [the surveyor] will defer to your [the commissioner's] opinion until the case is submitted and decided by the department.

The surveyor came out long after the initial point was agreed upon, and the monument erected and the line begun, relieved the acting surveyor, and protested against the point. With the protest and the views of the commissioner before him, both sides it is presumed fairly stated, the honorable Secretary instructed the surveyor to sign the maps; but before the instructions reached him, he was relieved, and I was appointed in his place, with the same instructions.

I therefore considered the matter as settled, and the action of the government as final. "The official documents which have been prepared for the purpose," referred to in my letter of appointment and instructions, never having been presented, no action has been taken in the matter definitely and finally to "settle this important point." I quote from my instructions, for, as I shall presently show, it has, by the views taken of the subject by both sides, ceased to be an important point.

But I have done this in compliance with the letter and spirit of my instructions. Mr. Salazar, the Mexican commissioner and surveyor, met me at the Presidio del Norte, August 1st, to sign the maps of the Rio Grande forming the boundary. Neither party had the maps properly prepared, nor was Mr. Salazar at all prepared in money or means to go on with the work at the rate I was progressing. I had already signed, conjointly with him as astronomer and surveyor, the only maps fit for signature, but he remained pressing me to sign other maps which involve incidentally the initial point agreed upon by Mr. Bartlett, Mr. Conde, Mr. Salazar, and Mr. Whipple, from which Colonel Graham had started his survey of the river. I therefore, on the 28th August, signed the maps according to my instructions, with the reservation contained in the paper, a copy of which is herewith sent, marked "A," signed conjointly by Mr. Salazar and myself, and the statement therein referred to setting forth on the face of the maps that it was the "*boundary-line agreed upon by the two commissioners, April* 20, 1851."

I presume it was never intended I should give my certificate, as astronomer and surveyor, to the correctness of the determination of a point which had been determined by the observations of others, and without consultation or advice of mine. On the other hand, I do not for a moment doubt the power of the government to instruct me on the subject, or hesitate as to my duty to obey its mandates, which I understand as requiring me only to authenticate the initial point agreed upon by the commissioners of the two governments.

In reference to the importance of the point, I think it as well to state that the line agreed upon by the commission, April, 1851, is about 33' north of the line contended for, as that laid down by Disturnell's map, but it reaches about 16' of arc further west; and as both lines run 3° of longitude west, the difference of territory is 3° of longitude multiplied by about 40' of latitude, each having a middle latitude that may, for the purpose of computation, be assumed at 30°. Neither line gives us the road to California, and the country embraced in the area of the difference, with the exception of a strip along the Rio Grande about nine miles long and from one to two wide, is barren, and will not produce wheat, corn, grapes, trees, or anything useful as food for man, or for clothing.

Neither line will give us a channel of communication for posts along the frontier, without which it is impracticable to comply with the XIth article of the treaty, which enjoins the United States to keep the Indians out of Mexico.

When originally on the work, before the point was determined, having a knowledge of the country from previous reconnoissance, I had the honor of asking the attention of your predecessor to this very subject, in a communication dated April, 1849, San Diego, California, which was subsequently printed by the Senate. I then pointed out what I believed to be the only view taken of the treaty, which would have given us the road, it being, in truth, the only important matter involved in the question. No notice was taken of this, and I was superseded in my command until restored by you, although Mr. Clayton, the Secretary of State, had declined, on my application, to relieve me, on the ground of my knowledge of the particular duties to which I was assigned.

On my return to the work, both governments having been committed in the matter by the commission, the time was passed when anything could be effected with the Mexican commission.

It is not pretended that the view there taken of the treaty is as close a legal construction as that taken since; but it is the only one which could have given us a wagon road from the Del Norte to the Pacific by way of the Gila river. And it is believed that, if this point had been urged before discussion took place, or before either party had committed itself, the obvious advantages to both would have secured its adoption.

I have the honor to be your obedient servant,

W. H. EMORY.

The Hon. SECRETARY OF THE INTERIOR.

I give here a copy of my letter of April 2, 1849, which, had it received attention, would have been the means of saving much controversy and expenditure of time and money:

BOUNDARY COMMISSION, SAN DIEGO, *April* 2, 1849.

SIR: Paper marked "A" will exhibit to you the adoption of my determination of the astronomical line forming the boundary between the United States and Mexico, from the initial point on the Pacific to the junction of the Gila and Colorado rivers, by the Mexican astronomer and surveyor, Señor Don José Salazar y Larregui. The line passing through the five points stated in that paper, as determined by me, is in view of the Tecaté mountain, thirty miles distant, and Señor Salazar undertook to establish on the Tecaté a signal in the prolongation of this line, and has succeeded in doing so; and the same has been verified under my orders.

Knowing the long time that must elapse before the monuments arrive, I have, in conjunction with Mr. Salazar, to secure this line beyond all cavil, and for the convenience of property holders on either side, caused monuments of a pyramidal shape, twelve feet at the base, and twelve feet high, composed of stones and earth, to be erected at the points established. These extend over a space of thirty miles, and embrace all the settled portions. I have bound the government for the payment of one-half the cost of the monuments, the Mexican commission paying the other half.

You were apprised in my last despatch that this commission, when I received the charge of it, was without one cent of money, without a mouthful to eat, and without a hoof or wheel for transportation; and that I was deprived of the only means of doing anything, by being deprived at the same time of military command.

I have not been instructed to estimate funds for the past or future. I have no means of estimating the debts of the commission, but presume this has been done by the late commissioner. I think it proper, however, to send an estimate herewith of funds required by Brevet Captain Hardcastle, to enable him to carry out his instructions. I think it also proper to inform the Department, for the benefit of the operators from the "Paso del Norte," that authentic information has reached here, that the Mexican frontier towns of Fronteras and Santa Cruz, which have always been counted on by the officers of the commission to furnish supplies, have been ravaged by the wild Indians, and deserted by the inhabitants, and the means of subsistence of the Pimos Indians have been eaten out by the emigrants. In addition to the American emigration, a dense stream of "Sonoreans," and other Mexicans, is now pouring over a portion of the same route into California, desolating the herbage and means of subsistence as they pass. Five thousand and upwards have already penetrated the country this season, and it is estimated by intelligent men that fifteen thousand more are in movement in the same direction.

In connexion with this same subject, and reverting to my despatch No. 2, I presume enough was then said to satisfy you that the expedition should not move from the "Gila eastward." The fact alone, that all it may accomplish, if it can

accomplish anything, between the mouth of the Gila and the "Paso del Norte," beyond that of overcoming space, will be by the movement of the Mexican commission, growing out of the action of the joint commission of an ex parte character, and therefore of no value. But, in addition to this, we may lose a great advantage by pushing the survey in that direction—no less than the only practicable route for a railway over the Sierra Madre; which route is near the 32d parallel of latitude. That supposed to have been recently discovered by Lieutenant Simpson I believe impracticable. Had that intelligent officer come further "westward," he would have found an insurmountable barrier.

By pushing the survey eastward, and looking for a branch of the Gila which shall fulfil the conditions of the treaty—the first to intersect the boundary of New Mexico—you will inevitably be made to strike that boundary far north of the parallel of the copper mines; because all the streams south of that parallel, having their sources in the Sierra Madre, running towards the Gila, disappear in the sands before they reach Gila, except in cases of unusual freshets. Working eastward, their almost trackless beds must escape the notice of the keenest explorer. Working from the "Paso del Norte" northward and westward, you strike the sources of the streams themselves; and although they may disappear many leagues before reaching the Gila, they may nevertheless be affluents of that river, and fulfil the condition of the treaty.

Another view of the case may also be taken. The inaccuracy of the map upon which the treaty was made, and which thereby became a part of the treaty, is notorious. It is also known to all who have been much in the frontier States of Mexico, that the boundaries of those States have never been defined on the ground, and are unknown. This is particularly the case of the boundary betwixt New Mexico and Chihuahua. In this condition of things the commissioners must negotiate, and they may adopt the 32d parallel of latitude, until it strikes the San Pedro, or even a more southern parallel of latitude. This would give what good authority, combined with my own observations, authorizes me to say is a practicable route for a railroad—I believe the only one from ocean to ocean within our territory.

Another consideration is, the treaty makes the Gila for a certain extent the boundary. The Gila does not always run in the same bed; whenever it changes the boundary must change, and no survey nor anything else can keep it from changing. The survey of that river, therefore, as it fixes nothing, determines nothing, is of minor importance. It forms of itself a more apparent and enduring monument of the boundary than any that can be made by art; and on the principle that that which is of the greatest necessity should be done first, the line from the Paso del Norte, until it strikes a branch of the Gila, would seem to demand the first attention.

It is but just to say these are not views recently adopted by me; they were entertained and expressed before leaving Washington and since, and I urged that none but the astronomical party, and just as much of the commission, should be sent to the Pacific side as was necessary to fulfil the conditions required by the letter of the treaty.

Very respectfully, your obedient servant,

W. H. EMORY.

Hon. T. EWING, *Secretary of the Interior.*

[*Letter referred to in the note on page* 14.]

OFFICE UNITED STATES BOUNDARY COMMISSION,
Washington, April 23, 1856.

SIR: In answer to your instructions of April 22, predicated on a resolution of Congress, received this day, I have the honor to submit the following table, showing the several appropriations made by Congress for the survey of the boundary line between the United States and Mexico, as established under the treaty of Guadalupe Hidalgo:

U. S. Statutes.		Date of law.	Object of appropriation.	Amount appropriated.
Vol.	Page.			
9	301	Aug. 12, 1848	Running and marking boundary line under treaty of Guadalupe Hidalgo	$50,000 00
9	426	May 15, 1850	Do.....do.....do.....do.....do..	50,000 00
9	541	Sept. 30, 1850	Do.....do.....do.....do.....do..	135,000 00
9	614	March 3, 1851	Do.....do.....do.....do.....do..	100,000 00
10	17	July 21, 1852	Do.....do.....do.....do.....do..	80,000 00
10	95	Aug. 31, 1852	Arrearages of boundary commission	25,000 00
10	140	Dec. 23, 1852	Running and marking boundary line below El Paso, including expenses already incurred	120,000 00
10	209	March 3, 1853	Arrears due Major Emory's party	20,000 00
10	209	March 3, 1853	Expenses of Lieut. Whipple's party	6,000 00
10	209	March 3, 1853	Running and marking boundary line under treaty of Guadalupe Hidalgo	93,012 00
10	296	May 31, 1854	Arrearages prior to July 1, 1853	50,000 00
10	296	May 31, 1854	Engraving maps, views, &c., of boundary survey	10,000 00
10	570	Aug. 4, 1854	Compensation of officers, office-work, &c	38,100 00
10	664	March 3, 1855	Engraving maps, views, &c., of boundary survey	10,000 00
			Total	787,112 00

Of the above amount, the disbursement of only a very small portion came under my direction or within my knowledge. The item of $38,100 for office-work and the two items of $10,000, each were disbursed by Captain Thom under my immediate direction. Of the first sum, there was, January 1, 1856, a balance untouched of $24,445 54; and of the two last sums a balance of $12,900. As far as my authority has extended, there have been no defalcations.

I have also to submit a table showing the appropriations made by Congress for the survey of the boundary between the United States and Mexico, as established under the treaty of December 30, 1853.

U. S. Statutes.		Date of law.	Object of appropriation.	Amount appropriated.
Vol.	Page.			
10	568	Aug. 14, 1854	Running and marking boundary under treaty of December 30, 1853..	$168,130 00
10	661	March 3, 1855	Do.....do.....do.....do.....	71,450 00
			Total.....	239,580 00

Of the amount appropriated for the survey, &c., of the boundary under the treaty of December 30, 1853, most of it was disbursed by myself, and a portion by Lieut. Michler; and there remained, on the 1st of January, 1856, in the hands of the assistant treasurer of the United States at New York, to my credit $42,004 59

In the hands of Lieut. Michler 5,000 00

In the treasury of the United States at Washington, not drawn..... 51,450 00

Total..... 98,454 59

Total from above 37,345 54

Grand total..... 135,800 13

And I have further to report that no defalcations have occurred in those under my orders.

I have the honor to be your obedient servant,

W. H. EMORY, *U. S. Commissioner.*

Hon. ROBERT MCCLELLAND, *Secretary of the Interior.*

The field-work of the boundary survey under the treaty of 1850, confided to my charge, was finished within the time estimated by the government. It will be seen from the above statement that the whole work will be completed at an expense much within the appropriation made by Congress.

CHAPTER II.

PERSONAL ACCOUNT CONTINUED.

ORGANIZATION OF COMMISSION UNDER TREATY OF DECEMBER 30, 1853.—TRIP TO EL PASO DEL NORTE.—JOURNAL OF JOINT COMMISSION.

On the 15th August, 1854, I received from the President of the United States, through the Hon. Robt. McClelland, Secretary of the Interior, the appointment of commissioner "to survey and mark out upon the land the dividing line between the United States and the republic of Mexico, concluded on the 30th of December, 1853, the ratifications of which were exchanged in the city of Washington on the 30th day of June, 1854." At the same time I received special instructions from the Secretary of the Interior, and a copy of the treaty, which will be found in the appendix.

The terms of the treaty required that each of the two governments should nominate one commissioner, and that "the two thus nominated should meet in the city of El Paso del Norte three months after the exchange of ratifications of the treaty, and proceed to survey and mark out the line," &c.

To reach El Paso del Norte in the time required by the treaty, (October 1st,) it would have been necessary to leave my outfit to take care of itself, and travel post-haste. Knowing well the character of the country in which that service was to be performed, I concluded to send forward a special messenger to meet the Mexican commissioner, and to remain and give my personal attention to the outfit. Everything in the way of astronomical and surveying instruments, transportation, arms, provisions, and medicines required for the campaign, was to be provided in advance, and shipped from New York.

By employing men to work night and day, and shipping my wagons, at great expense, on board the passenger steamers, I was enabled to land the whole outfit at Indianola, Texas, by the 25th of September.

On the night of the 18th September, while crossing the Gulf, a terrific tornado swept the coast, and every wharf in Matagorda bay, except that upon which a portion of our outfit was landed, was carried away, and the town of Matagorda itself levelled with the ground. We found at Indianola a number of mules belonging to the old commission; but they were in such miserable condition, I determined to send them up to San Antonio with the empty wagons, and hire transportation for the supplies which had been purchased in New Orleans and safely landed at Indianola. The low country between Indianola and Kilpatrick's, a distance of twenty miles, was inundated, and the roads so bad, that the contractor for the transportation of our supplies was twenty days passing as many miles. The yellow fever was then prevalent, and added much to our embarrassments, several of our party having been stricken down at the moment of entering upon a distant and arduous service. I was, however, so thankful to have escaped without damage the tornado of the 17th–19th of September, which proved so disastrous around us, that every other adverse circumstance seemed trifling.

On the 25th of October I had succeeded in enlisting and equipping sixty or seventy men for the service, and in purchasing the necessary number of animals.

The escort, consisting of a company of the 7th infantry, commanded by Brevet Capt. E. K. Smith, reported itself in readiness on the same day, and on the next we took up the line of march for El Paso.

Before leaving Washington I organized, with the assent of the Secretary, a party, under Lieut. Michler, to proceed to California and work from the Pacific side to meet me.

When the commission took the field the following was its organization; and this organization was continued with scarcely a change until the successful conclusion of the field-work, in the fall of 1855:

W. H. Emory, U. S. commissioner, chief astronomer and surveyor.
Chas. Radziminski, secretary.
Lieut. Chas. N. Turnbull, corps Topographical Engineers, general assistant.
M. T. W. Chandler, do.
J. H. Clark, principal assistant astronomer.
Hugh Campbell, assistant.
Winder Emory, clerk.
Maurice Von Hippel, principal assistant surveyor.
Chas. Weiss, assistant surveyor.
F. Wheaton, reconnoitring assistant.
Wm. Likens, assistant in charge of commissary stores.
Jas. Houston, assistant.
David Hinkle, do.
Benj. Burns, assistant in charge of instruments.
Lieut. N. Michler, corps Topographical Engineers, in charge of party operating from the Pacific side.
Arthur Schott, assistant to Lieut. Michler.
E. A. Phillips, do. do.
John O'Donoghue, do. do.

Capt. George Thom, corps Topographical Engineers, with a few civil assistants, was left in Washington in charge of the office, to reduce the observations and project the work done under the old commission.

Besides the above, there were employed in the different parties about one hundred men, in the various capacities of teamsters, laborers, cooks, servants, and arrieros.

The infantry escort accompanied the commission from the time of leaving San Antonio until our return to El Paso. From that point to San Antonio it was commanded by Lieutenant Cummins. At El Paso, on the outward journey, we received an accession to the escort of thirty dragoons, commanded by Lieutenant Hastings. Lieutenant Michler was escorted by a detachment of artillery soldiers, commanded by Lieutenant (now Captain) Patterson. In addition to his military duties, Captain Smith aided me materially in the business of the boundary survey.

The first part of the journey from San Antonio to El Paso was very slow, in consequence of the heavy rains, which made the roads in many places almost impassable for our heavily laden wagons. Beyond Devil's river we found the roads good, water and grass plenty, and succeeded at last in reaching El Paso in time for the Mexican commission.

We did not see an Indian on the route, although in front and in rear of us they were committing depredations along the whole road.

At Cantonment Blake, on the Devil's river, they waylaid and killed a couple of soldiers; at Live Oak they drove off, in open day-light, all the animals of the military post temporarily established at that point. At Fort Davis, we found they had attacked a party and killed a sergeant and musician; just beyond, at Dead Man's Hole, they attacked the mail party, and would probably have handled them severely, had not another party coming in the opposite direction, joined them at the critical moment.

On arriving at the cañon about seventy miles below El Paso, I left my escort and train, with directions to proceed slowly up the river, while I went to make such arrangements with the Mexican commissioner as would enable me to move the parties directly on the new line, and commence operations.

I accomplished this with the Mexican commissioner satisfactorily; although winter had now set in with severity, and the small-pox showed itself in our camp, and we had just accomplished a journey of sixteen hundred miles, every assistant and man took the field as cheerfully as if he had just left his barracks.

Each one of the principal assistants was selected upon the estimate of his professional abilities, derived from personal knowledge, and I had no reason to make any changes of importance from the beginning to the end of the work. My own expectations, and I hope those of the government, were entirely fulfilled in the manner in which the work was accomplished. Under all circumstances—during the cold winter exposed upon the bare ground of the bleak plains, and in the summer to the hot sun blazing over the arid desert—every order was executed with fidelity, and the work was completed within the time, and largely within the amount appropriated by Congress. We passed the entire width of the continent and returned with the loss only of two men, and without losing a single animal, (except those worn out by service,) or suffering a stampede by the Indians; at the same time that our co-operators on the Mexican commission were twice robbed of every hoof by the Apaches, and extensive losses were sustained by other detachments of United States troops, and by our citizens traversing this region.

I close this short personal account by giving the journal of the joint commission, composed of Señor Salazar and myself. It will be seen, that throughout the whole expedition the utmost harmony prevailed, and I take this occasion to express, not only for myself, but for the whole American commission, the pleasant recollection of the agreeable intercourse which existed between ourselves and the Mexican commissioner, and the officers under his command. Señor Salazar failed to receive from his government means to carry on the work with the rapidity contemplated in the agreement with myself, and he was twice crippled in his operations by the depredations of the Indians.

JOURNAL OF THE JOINT COMMISSION.

PASO DEL NORTE, *December* 4, 1854.

The undersigned, commissioners respectively on the part of the United States of America and of the Mexican republic to run and mark the boundary line between the two countries, according the treaty concluded in the city of Mexico on the 30th day of December, 1853, met informally in the town of El Paso del Norte on the 2d instant, and on the 4th, the date of this joint record of their proceedings, they had another meeting in the same town, when, having exchanged credentials, they proceeded to discuss and arrange the business upon which they were called together by their respective governments.

Both parties being ready to commence operations, and there being no difference of opinion upon the scientific and practical manner of determining the boundary between the two countries, it was agreed that each should proceed, with all the means at his disposal, to determine the initial point of said boundary on the Rio Grande, which the treaty stipulated to be at the parallel of 31° 47′ north latitude. It was further agreed that as soon as each party ascertained the precise point, both parties should compare notes and eliminate any differences or errors, by the methods best known to science, and conclude the final result, giving to each set of observations the weight due to them.

There being no other business before the commission, it adjourned, to meet when either commissioner should signify to the other that he had concluded the observations necessary to determine where the parallel of 31° 47′ north latitude intersects the Rio Grande.

W. H. EMORY.
JOSÉ SALAZAR Y LARREGUI.

RIO GRANDE, LATITUDE 31° 47′, *January* 10, 1855.

On the 9th of January, both commissioners having finished the observations necessary to determine the initial point of the boundary on the Rio Grande, met this day to compare results. The necessary measurements being made to connect the two observatories, and also the observatory established at Frontera in 1851–'52, it was ascertained that the difference between the determinations of the parallel of 31° 47′, made by the two commissions, was eighty-four hundredths of one second. It was then mutually agreed to take the mean between the two results; and the point thus ascertained was marked on the ground in presence of both commissioners, as the point where the parallel of 31° 47′ strikes the river; that is to say, the point where the boundary under the treaty of December 30, 1853, leaves the river to run westward.

The commission adjourned, to meet to-morrow at 10 o'clock a. m.

JOSÉ SALAZAR Y LARREGUI.
W. H. EMORY.

RIO GRANDE, LATITUDE 31° 47′, *January* 11, 1855.

The commission met and laid off the tangent to the parallel of 31° 47′, and having agreed upon the elements assumed for the figure of the earth, (Bessel's,) and compared the results of their computations for the length and azimuth of the ordinates connecting the tangent with the parallel, found them to correspond.

The commission adjourned, to meet to-morrow at 10 o'clock a. m.

JOSÉ SALAZAR Y LARREGUI.
W. H. EMORY.

PASO DEL NORTE, *January* 12, 1855.

The commission met agreeably to adjournment, and agreed to place one monument as near the river as the nature of the ground will admit, to be of dressed stone, having on the north face:

U. S.
BOUNDARY,
Under the treaty of December 30, 1853.

On the south face:

R. M.
Limite conforme al tratado de 30 de Diciembre de 1853.

On the west:

JOSE SALAZAR Y LARREGUI, *Comisionado Mexicano.*

On the east:

W. H. EMORY, *U. S. Commissioner.*

The commission further agreed:

1st. To erect a pyramid of rough stone, cemented with mortar, where the line strikes the crest of the first range of hills, and one of the same description in sight of the road leading from El Paso to the north.

2d. To put up a monument at the extremity of the line of 31° 47′ of the same kind, and with the same inscription, as that first named; to put up pyramids along the line wherever the facilities of water and stone will admit.

3d. To lay the foundation of the monument nearest the river on the 24th January.

There being no further business before the commission, it adjourned, to meet at 12 m. on the 24th instant.

W. H. EMORY.
JOSÉ SALAZAR Y LARREGUI.

PASO DEL NORTE, *January* 26, 1855.

The commission met on this day.

The Mexican commissioner having notified the American commissioner, by letter, on the 16th, that, in consequence of his absence in making a reconnoissance, he could not attend the placing of the corner-stone of the monument until the 31st, the American commissioner agreed with him to postpone the establishment of the foundation of the monument to that day at meridian, and we have this day met to give validity to that agreement. The American commissioner stated that, in consequence of not getting a sufficient supply of water immediately on the line, he had somewhat changed his plans, and had adopted, as the base of his operations, the north and south line between the parallels of 31° 47′ and 31° 20′. The first division of his party (the astronomical) had completed all their work here, and was ready to move on that line, escorted by the dragoons, and would so move to-morrow; that he, the commissioner, would follow with the balance of his party, the surveyors and the supplies, immediately after the completion of their joint labors on the 31st instant. He further stated, he had established points on the line beyond the road, and by the 31st his parties would have

progressed with the line as far on the Mesa as was convenient to operate from this side. He proposed to the Mexican commissioner to concur in these plans, and to start also westward. The Mexican commissioner stated he fully concurred in those plans and adopted them, but that in consequence of having no escort, he could not move at the time proposed, but would follow as soon as his escort arrived; the Mexican commissioner further stated, that whilst here he would take the charge of the three monuments, agreed upon at our meeting of the 12th to be erected at this end, and see them completed.

The American commissioner assented, and further stated that he would leave Jean Ball, the stone-mason, to assist in the work under the direction of the Mexican commissioner.

The American commissioner stated, that the treaty required, for the establishment of the line, the concurrence of the two commissioners; that when he establishes the points west in the absence of the Mexican commissioner, if any accident should prevent a subsequent visitation and verification of the points by the Mexican commissioner, the validity of the point might be questioned, and the work of himself, the American commissioner, achieved at great cost, might go for nothing.

The Mexican commissioner stated, in reply, that to avoid that difficulty, he would now adopt all those points which the American commissioner, in his absence, might establish, in his own name, on the line which the treaty stipulates.

JOSÉ SALAZAR Y LARREGUI.
W. H. EMORY.

INITIAL POINT ON THE RIO GRANDE, LAT. 31° 47′,
January 31, 1855.

The commission met, according to agreement, at meridian.

The chief officers of the vicinity, military and civil, from both sides of the line, being present, the foundation of the monument was laid. The following paper—one copy in English, the other in Spanish—was signed by the two commissioners and by the persons aforesaid, placed in a glass bottle, and deposited, at the depth of five feet, under the centre of the monument:

COPY OF THE PAPER.

"We, the undersigned, have this day assembled to witness the laying of the foundation of the monument which is to mark the initial point of the boundary between the United States and the Republic of Mexico, agreed upon, under the treaty of Mexico, on the part of the United States by William Hemsley Emory, and on the part of the Republic of Mexico by José Salazar y Larregui, latitude 31° 47′.

"W. H. EMORY, *U. S. Commissioner.*
"JOSÉ SALAZAR Y LARREGUI.
"C. RADZIMINSKI, *Sec'y U. S. B. C.*
"JOEL S. ANKRIM.
"E. B. ALEXANDER.
"CALEB SHERMAN.
"E. K. SMITH.
"JUAN JOSE SANCHEZ.
"ANTONIO ZEPEDA.
"GUADALUPE MIRANDA.
"VINCENTE AGUIRRE."

The American commissioner stated that he had already sent the whole of his astronomical force to the western end of the 100-mile line, and that it was his intention to follow in the coming week with the balance of his force.

The question of the time and place of the next meeting having been raised, the Mexican commissioner stated it was not in his power to say when he would be able to join the American commissioner, but that he would endeavor to do so as soon as possible.

The commission adjourned, to meet when the Mexican commissioner shall join the American commission.

JOSÉ SALAZAR Y LARREGUI.
W. H. EMORY.

FORT BLISS, *August* 14, 1855.

In pursuance of notification from the Mexican commissioner of his arrival, made in conformity with the last article agreed upon January 31, 1855, the commissioners met this day.

The United States commissioner stated that he had concluded the running and marking of the line up to the 111th meridian of longitude, at which point he met the United States and Mexican parties working eastward from the Colorado, and that in the unavoidable absence of the Mexican commissioner he had concluded an agreement with Señor Jimenez, first engineer of the Mexican commission, which he now presented to the Mexican commissioner, and asked his approval of the same.

The agreement is in the words following, to wit:

Señor Don Francisco Jimenez, first engineer of the boundary commission, on the part of Mexico, being duly empowered by the Mexican commissioner to run the line between the Colorado and the 111th meridian of longitude, having arrived at the camp of the American commissioner, the latter invited him, in the absence of the Mexican commissioner, to a conference, having for its object the more speedy completion of the unfinished portion of the line; and accordingly the two have met this day, and the following is the report of that conference and its results:

The American commissioner stated that he had separated from the Mexican commissioner on the 6th of February; that the Mexican commissioner being unable to proceed with the line at that time, had empowered the American commissioner to proceed with it, and had agreed to adopt the line established by him in conformity with the treaty.

The journal of the joint commission, duly signed and sealed, was exhibited to Señor Jimenez, and a copy of the record of the 26th January, duly authenticated, furnished him. The American commissioner stated that he had caused the line to be run and the monuments to be erected as far as the 111th meridian of longitude. That meridian had been established from observations at Los Nogales by principal assistant Clark; and Señor Jimenez was invited to inspect the instruments, still in position, with which these observations were made, the observations themselves, and the computations by which the results were obtained. The result of that inspection being satisfactory, the American commissioner proposed, that in view of the urgent demands of both governments, to complete the line, Señor Jimenez should unite with the American party, and direct the whole force of both parties to complete the tracing and marking of the line on the face of the earth from the 111th meridian, already established, to the point where Señor Jimenez and Lieutenant Michler left off in their attempt to run the line eastward.

Señor Jimenez assented to this proposition, and it was, therefore, agreed as follows:

That the plan of triangulation is impracticable; that the American and Mexican surveying party shall proceed forthwith to run the unfinished portion of the line; take the topography near the line; erect monuments at points where the line crosses a mine, a settlement, a road, or water.

It is agreed if either party break down, the other is not to suspend or delay operations in consequence of it.

It is agreed the Mexican party is to determine the latitude and longitude of some central point of the line as a check upon the tracing of the line, and the result is to be furnished the American commissioner, who agrees to accept that determination.

It is further agreed that the convention entered into between Señor Jimenez and Lieutenant Michler, April 26, and the additional article agreed upon May 1, 1855, are approved in all the articles not in conflict with this convention.

W. H. EMORY,
United States Commissioner.
FRANO. JIMENEZ,
First Engineer de la Como. de Limites Mexicano.

LOS NOGALES, *June* 21, 1855.

The Mexican commissioner having approved this step on the part of the first engineer of his commission, the United States commissioner gave a brief legend of operations up to the 111th meridian of longitude, and invited Mr. Salazar to inspect the notes, astronomical and geodetic, upon which the line was based, and the rough draughts of the maps made in the field.

The following is the substance of the legend:

After concluding all operations in the vicinity of the Rio Bravo, and pushing the line as far as was convenient, from that place, an astronomical station was established at Carrizalillo, which proved, from 72 observations with 46-inch zenith telescope, to be in latitude 31° 50′ 55″.23 north; and longitude 107° 56′ 03″.90, the result of observations during one lunation.

Carrizalillo was the nearest water to the terminal point of the 100-mile line near to parallel 31° 47′. A monument was established on the road due south of the observatory, and the parallel extended in both directions—east, until it met, in the sand-hills, the line produced from the Rio Bravo; west, it was extended to the end of the 100 miles, and the parallel was obtained by measuring ordinates from the tangent. The 100 miles was obtained by combining the observed longitude at Carrizalillo, and the distance actually measured.

From the end of the 100 miles a line was produced due south to meet the parallel of 31° 20′. The reconnoissance to find water at the junction of the meridian and 31° 20′ failed, and the observatory was established at the Espia, on the Rio Janos, ten or twelve miles east of the meridian. An elaborate set of observations (81) with zenith telescope, gave us the latitude of this observatory 31° 20′ 56″.45; the tangent of 31° 20′ was determined from this by direct measurements and produced to intersect meridian, and ordinates laid off to ascertain parallel. After producing parallel about seven miles, it was ascertained, as will be seen by the map, that the Ojo del Perro was near the line. The zenith telescope was reset, and a new tangent obtained; which result corresponding well with the last, this tangent was produced to the San Luis range of mountains. At the San Luis springs, about thirty miles west of the initial point of the parallel 31° 20′, a new observatory was erected, the latitude of which (31° 20′ 31″.51) was

ascertained by more than 97 observations. The tangent to the parallel 31° 20′ was ascertained and produced in both directions, east and west, and the ordinates to the curve of the parallel established. The coincidence between the new tangent and the old one, produced from Ojo del Perro, was satisfactory; after making the necessary allowance for the difference of ordinates, the error was found to be only a few feet. The tangent west was produced across the level of the San Luis valley and the Guadalupe Pass. In the mean time, a new observatory was erected at San Bernardino springs, and the latitude obtained with the same instrument, and nearly the same set of stars, was ascertained to be 31° 19′ 40″.38 by 57 observations. A third tangent was produced east and west, that east being found to correspond and verify the second tangent. This last tangent, being the third, was, on account of the absence of water, produced as far as the hills west of the San Pedro. While this was progressing, the astronomical party established itself to the north of Santa Cruz, on the river of the same name, and the latitude of the point was ascertained to be 31° 17′ 56″.33, from 73 observations. From this, a point on the parallel 31° 20′, due north, was ascertained by direct measurement, and a fourth tangent obtained, as in all the preceding cases, by elaborate measurements of the elongations of Polaris. An apprehension was entertained that the third tangent, by reason of its great prolongation, sometimes, as in passing the Guadalupe mountains, running over rough country, might prove crooked; but the verification by means of the fourth tangent was complete, showing the greatest probable error of either tangent, a distance of only 15 or 20 feet.

A chronometric reconnoissance was then made to the westward, and it was ascertained that the nearest durable water to the intersection of the meridian of 111 degrees west of Greenwich, and the parallel of 31° 20′, was at Los Nogales. At this point was established an observatory. The transit and zenith instruments were both mounted; and the result of 120 observations with the latter, and observations during two lunations with the first, gave for the latitude 31° 21′ 00″.48, and longitude 110° 51′ 02″.10 west of Greenwich. From observations at this observatory a fifth tangent was deduced, and extended by a separate party in both directions, running westward until the 111th meridian of longitude was reached. Owing to the difficulties of the country, the longitude was transferred by direct measurement and by triangulation.

Before this was concluded, a despatch was received giving the joint result of the Mexican and United States parties, of the latitude and longitude of the initial point on the Colorado river. With these data the azimuth of the line westward was computed to be 69° 19′ 45″.9, and laid off by measurements from the elongation of Polaris.

This left nothing to be done but to trace the line and complete the topography between the 111th and the Colorado, and the dispositions made for that are all embraced in the convention between Senor Jimenez and myself, and Señor Jimenez and Lieutenant Michler, to which your approval has been given.

Major Emory, the American commissioner, further stated, that in reference to the instruments used, and the methods employed in obtaining results, Mr. Salazar, the Mexican commissioner, from long experience, was familiar with the mode adopted by both commissions, and it was therefore not necessary to enter into particulars—the notes would show for themselves; but he begged to remind Mr. Salazar that they had discussed before, the subject of longitude, and it was agreed between them, that in all determinations of longitude by the moon and moon-culminating stars they should take the Greenwich ephemeris, and not await the publication of the corresponding observations made at Greenwich, as at this distance it would necessarily involve a delay of eighteen months or two years—a result clearly not contemplated

by either government. The correction due from corresponding observations cannot be foretold, but is small, and as likely to be to the advantage of one as the other.

The monuments erected on the line were of two classes—first, of dressed stone, laid without mortar; second, of round stones undressed, forming simply mounds.

Of the first, one was erected at the point south of the Carrizalillo; another at the intersection of meridian 108° 09′ 41″.85 and parallel 31° 20′; one at San Luis springs; two at San Bernardino; one at San Pedro; one north of Santa Cruz; one where the line crosses (second time) Santa Cruz river; one at Los Nogales; and one at intersection of 111° and 31° 20′. Many mounds of the second class were erected, always at points where the line crosses a road or trail. Mr. Salazar stated that he had erected, of dressed stone, in a permanent and durable manner, a monument at the initial point on the Rio Bravo, and two monuments west of that point.

To give the Mexican commissioner time to make a thorough and critical examination of the data upon which the determinations are based, and to inspect the maps and take copies of such portions of them as he might desire, they were placed in his hands, and the commission adjourned, to meet in El Paso at 10 o'clock on the 16th.

W. H. EMORY, *U. S. Comm'r.*
JOSÉ SALAZAR Y LARREGUI, *Com'o Mex'o.*

EL PASO, *August* 16, 1855.

The commission met, agreeably to adjournment.

Mr. Salazar, the Mexican commissioner, stated he had fully examined all the documents, observations, notes, and maps, and the result of his examination was an entire conviction that the line had been run correctly throughout, including those parts during the running of which he was necessarily absent. But since the subject had been called to his notice by Mr. Emory, the U. S. commissioner, to the effect that, in consequence of the absence of water at the time, only a mound had been established at the junction of the meridian and parallel of 31° 47′, he thought, now that the rainy season had commenced, and water was everywhere to be found, a monument of dressed stone should be erected at that point; and he stated he would himself undertake to place it at that point. He stated, also, in consequence of the absence of water he had not been able to place a monument, as he had intended to do, to the south of the Potrillo mountains, on the parallel of 31° 47′, and that he would do both at the same time.

Mr. Emory, the American commissioner, stated his assent to this proposition, and further stated, that although he believed he had erected monuments or mounds along the whole line wherever the line crossed or passed near permanent water, a road, a mine, or town, or, in fact, any habitable point, yet he desired Mr. Salazar, if, in the course of his visitation of those parts of the line not before examined by him he should see any point omitted where a monument should be placed or substituted for a mound, not to hesitate to do so.

Mr. Emory said he would now state what he had informally stated before, that he had directed Lieut. Michler to send him an express to San Antonio the moment Señor Jimenez and himself finished the topography of the line between the 111th meridian and the Colorado.

The examination of the notes, maps, &c., being completed, and all discussion of the different subjects connected with the line being closed, the results of the foregoing conferences were embodied in the following articles of agreement:

1. Mr. Emory, the American commissioner, agrees to adopt, unconditionally, all monuments, mounds, lines, and points now established by Mr. Salazar, the Mexican commissioner, and by Don Francisco Jimenez, first engineer of the Mexican commission.

2. Mr. Salazar, the Mexican commissioner, agrees to adopt unconditionally all the monuments, mounds, lines, and points now established by Mr. Emory, the American commissioner, and by his assistants, reserving the right to substitute a monument for a mound at the intersection of the meridian with the parallel of 31° 47′, and to erect a mound or monument on the same parallel to the south of the Potrillo, and at any point along the line already established where it may appear to him necessary, and where heretofore it was impracticable, owing to the absence of water.

3. The two commissioners agree to declare, and do declare, the line surveyed, marked, and established as far as the 111th meridian of longitude, as the true line of boundary between the two republics, and they agree also to declare, and do declare, the line established from the 111th to its intersection with the Colorado, the true line between the two republics. They further agree to declare the line fully surveyed, marked, and established through its whole extent as soon as notification is received from Señor Jimenez and Lieutenant Michler that the topography of the last named line is completed between the 111th meridian and the Colorado river, and it shall be the duty of each to inform the other when such notification is received, and also to report to their respective governments that all the field-work of the boundary is concluded.

4. To carry out the stipulations in the first article of the treaty of December 30th, 1853, requiring the commissioners to make proper plans of their operations. It is agreed that the two commissioners, with their assistants, shall meet in the city of Washington on the first day of April, 1856.

W. H. EMORY, *U. S. Commissioner.*
JOSÉ SALAZAR Y LARREGUI, *Comm'o Mex'a.*

There being no further business before the commission, it adjourned, to meet in Washington, April 1, 1856.

W. H. EMORY, *U. S. Commissioner.*
JOSÉ SALAZAR Y LARREGUI, *Comm'o Mex'a.*

AGREEMENT BETWEEN LIEUTENANT MICHLER AND SEÑOR JIMENEZ, REFERRED TO AT THE MEETING OF THE JOINT COMMISSION, AUGUST 14, MADE AT CAMP NEAR THE INITIAL POINT ON THE RIO COLORADO, ON THE TWENTY-SIXTH OF APRIL, 1855.

According to article first of the treaty of December 30, 1853, between the republics of the United States and Mexico, we, the undersigned, [illegible]ed to fix the initial point on the Rio Colorado, twenty English miles below the [illegible] river with the Gila, and to trace and mark the line from this point to the inter[illegible] parallel of 31° 20′ north latitude, with the 111th meridian of longitude west [illegible]—all the operations necessary to determine this point and the direction of the line having been completed—agree as follows:

1. That the latitude of said initial point, by a mean of the results obtained by each party, is 32° 29′ 44″.45 north, and that the longitude is 114° 42′ 44″.53 west from Greenwich, determined from a triangulation by N. Michler, Lieutenant Topographical Engineers, United States army, who has transferred the position of the monument on the old boundary line near the junc-

tion to the new initial point. This longitude has been adopted by Mr. Francisco Jimenez, first engineer Mexican boundary commission, although he proposed to refer it by flashes between the two points.*

2. That with the above data the computed azimuth of the line running eastward is found to be 71° 20′ 43″.8 southeast at the initial point, and 69° 19′ 45″.9 northwest at the end of the line, and the distance between the two points is 382,844.87 metres, equal to 237.63565 English miles. Having commenced to trace said line on the bank of the river, distant from the initial point 964.62 metres, equal to 3,164.84 English feet, the azimuth at this point, newly computed, was found to be 71° 20′ 25″ southeast.

3. That the line be traced by both parties at the same time, each alternating with the other at the successive stations; that the distance of the line be measured by triangulation, one party operating from the initial point to the environs of Sonoyta, the other thence to the termination of the line; and that the results be mutually exchanged.

4. That at all prominent points of the line which are deemed proper, suitable monuments, from such materials as are at hand, be erected to mark it.

5. That the point where the line has commenced to be traced be called by the Roman number (I;) that all succeeding stations shall be in the order (II,) (III,) (IV,) &c., &c.

6. That as it is impossible to place a permanent monument at the starting point (I) of the line, an iron monument has been placed at station (II) in the direction of the line, and distant from station (I) 3171.12 metres, equal to 10404.12 English feet; computed latitude of said monument, 32° 29′ 01″.48 north, and longitude 114° 46′ 14″.43 west of Greenwich.

7. That the above be submitted to the consideration of the commissioners of the respective countries for their approval.

N. MICHLER, *Lieut. Topl. Engrs. U. S. A.,*
U. S. Boundary Commission.
FRANCISCO JIMENEZ,
1st Ingo. de la Com. del Limite Mex'o.

After having signed the above agreement the tracing of the line was continued, in accordance with the same, from station II to station III, a distance of 829.81 metres. From station III a party was sent to a point of the mountain range, about twenty-five miles distant, to endeavor to establish station IV. This party having made a reconnoissance of the country for the purpose of finding water, was unsuccessful in discovering sufficient for the wants of even the small number of men necessary to execute the work; the nature of the country forbid the practicability of furnishing by any means of transportation what was deemed necessary, as it is a continuous desert of heavy sand, entirely destitute of vegetation. A party previously sent to reconnoitre the country for water also brought the intelligence that not a drop was to be had from the Colorado to Quitobaquita, a distance of one hundred and twenty-five miles in the direction of the line. In consequence, the [illegible] of the latter impracticability of prosecuting the work from the west end of the line, we, the undersigned, on this the first day of May, 1855, agree to add the following article to the above agreement:

8. That both parties cease operations on this west end and proceed to the east end of the line, by the road along the Gila, the only one available at this season of the year, there to fix the

* NOTE.—Captain Jimenez subsequently caused the meridian on the old boundary, and the new initial point on the Colorado, to be connected by triangulation, and obtained the same result as Lieutenant Michler.

point of intersection of the parallel of 31° 20′ north latitude with the 111th meridian west of Greenwich, and afterwards to proceed to trace the line from that point westward as far as practicable.

N. MICHLER, *Lieut. Topl. Engrs. U. S. A.*,
U. S. Boundary Commission.
FRANCISCO JIMENEZ,
1st Ingo. de la Com. del Limite Mex'o.

WASHINGTON, *December* 18, 1855.

SIR: I communicated to you, a few days ago, a telegraphic despatch reporting the completion of the survey of the boundary.

I have now the honor to inform you that I have receiv[redacted]nformation of the arrival of the last surveying party of the commission in San [redacted]tonio, and the completion of the work assigned to it.

I have also to communicate to you the copy of a letter from Señor Salazar, the Mexican commissioner, informing me of the complete fulfilment of the 3d article of the convention with him, signed August 16.

The field-work of the boundary commission is therefore at an end.

I have the honor to be, your obedient servant,

W. H. EMORY, *U. S. Commissioner.*

Hon. ROBERT MCCLELLAND, *Secretary of the Interior.*

[Translation.]

JANOS, *October* 15, 1855.

SIR: Lieut. Michler has just delivered to me, personally, an official note, whereby I am informed that the survey of the line between the meridian of 111° and the Colorado has been completed.

This I have communicated to my government; and I advise you of the same, hoping that you will be pleased to communicate it to that of the United States, conformably to the resolution of article 3d of the convention held on the 16th of August of the present year.

I have the pleasure again to subscribe myself, with the greatest respect, your obedient servant,

JOSÉ SALAZAR Y LARREGUI,
Mexican Commissioner, &c., &c.

Col. W. H. EMORY,
United States Commissioner.

[Translation of official document sent by Mr. Salazar to the government of Mexico.]

EXCELLENT SIR: With my note under date of the 20th August, I enclosed to you copies of the last meeting held by the commissioner of the United States and myself on the 14th, 16th, and 20th of that month. By the 3d article of the agreement of the 16th, your excellency will have seen that we agreed on declaring, and do declare, in effect, that the line was completely *surveyed*, *marked*, and *fixed* in all its length, so soon as notice was received from Señor Jimenez and Lieut. Michler that the topography of the last-mentioned line had been completed between

the 111th meridian and the Colorado; and the same 3d article imposes upon us the mutual obligation to advise each other, and our respective governments, that all the field-work of the line was concluded.

In complying with the 3d article of this convention, celebrated on the 16th August, between the American commissioner (Major W. H. Emory) and myself, I now notify your excellency that the topography of the line between the 111th meridian and the Colorado is now complete, by the acknowledgment of Messrs. Jimenez and Lieut. Michler, as your excellency will see by the original letter, which is herewith enclosed, and which was handed to me in person by Lieut. Michler, who to-day takes his departure for the United States; and Lieut. Michler also informed me that Señor Jimenez had started on the 1st instant for the city of Mexico, after they had, together, concluded and officially agreed upon the line which had been placed under their charge.

All the work, therefore, necessary for the surveying, marking, and establishing of the boundary line between Mexico and the United States, in conformity with the treaty of the 30th of December, 1853, is now terminated.

In carrying out still further the requirements of the said 3d article of the convention with the commissioner of the United States, I have to-day written him as follows:

"JANOS, *October* 15, 1855.

"SIR: Lieut. Michler has just handed to me, in person, an official note, by which I am informed that the topography of the line between the meridian 111° and the Colorado is completed, the which I have communicated to my government; and I advise you of the same, trusting that you will also communicate the fact to the United States, in conformity with the 3d article of the convention made between us the 16th August.

"With great respect, I have the honor to be, &c.,

"JOSÉ SALAZAR Y LARREGUI.

"Sr. Don W. H. EMORY,

"*Commissioner of the United States.*"

And now, most excellent sir, the treaty indicates who should declare surveyed, marked, and established (or fixed) the boundary line, and gives to the commissioners ample powers; and thus no doubt can exist that the commissioners, and not the governments, can, and must, make this declaration. This was accordingly done by Major Emory and myself, as such commissioners, by our convention on the 16th of August, as shown by its terms, with the sole condition that it shall be valid whenever either of us received the advice which I have just communicated to your excellency and to the American commissioner. It now only remains for the government of the United States to fulfil its part of the obligations imposed by the 3d article of the treaty.

God and liberty. Janos, October 15, 1855.

JOSÉ SALAZAR Y LARREGUI.

His Excellency the MINISTER OF FOREIGN RELATIONS, *Mexico.*

WASHINGTON CITY, *June* 24, 1856.

In pursuance of previous adjournment, the two commissioners met this day at the office of the joint commission. Señor Salazar stated that after he separated from Mr. Emory on the 20th August, 1855, he reviewed with his parties the different lines of the boundary; that is to say, the parallel 31° 47′, the meridian, and the parallel 31° 20′, on which lines the Mexican commission executed the following work:

From the point south of El Carrizalillo, on which was erected a monument, he observed minutely on Polaris to determine the prime vertical on both sides, east and west. The prime vertical and the parallel 31° 47′ were connected by a triangulation—on the east side with that which had been made at the initial point, and on the west side with the intersection of meridian. By this triangulation five points to the east were fixed, at which points he caused to be erected monuments of stone, with mortar, because he found not one established by the United States commission in said direction.

The monument at the road was reconstructed of stone, with mortar. Upon all of them was inscribed the abridged inscription agreed upon. This line was then marked with ten monuments. That at the west end he caused to be erected of dressed stone with mortar, and inscribed with the complete inscription agreed upon, similar to that which was erected at the initial point cn the Rio Bravo.

Mr. Salazar stated that he observed at the south end of the meridian for latitude and longitude, his results differing very little from those of the United States commission; that from this point was carried north a triangulation which was connected at the north end with that made on the parallel 31° 47′, and was used to determine the position of said end on the parallel and on the meridian; that these two extreme points were left where the United States commission established them; that having found no monument between them, he caused one to be erected intermediate, in sight of the Ojo de los Mosquitos, of dressed stone laid in mortar, with the usual inscriptions; that the monument at the south end was erected of dressed stone and mortar with inscriptions similar in all respects to those at the north end and at the initial point. On the parallel 31° 20′, besides the observations he made at the intersection, he observed for latitude at San Luis springs, at San Bernardino, and San Pedro river; he found monuments at the two first named points, but none at the last; that his observations proved that the points were on the parallel 31° 20′, and he caused monuments to be erected at these points with mortar, having the usual inscriptions upon them, and that he thought it proper to erect a monument of the same kind in Guadalupe Pass.

Mr. Emory stated his entire satisfaction with what had been done by Mr. Salazar, and gave his assent thereto, except with regard to the monument at San Pedro river. He desired to call in Mr. Weyss, who was with Mr. Von Hippel when the monument was erected on the San Pedro. His own recollection was, that a very substantial monument had been erected at the San Pedro by the United States commission.

Mr. Weyss was brought before the commissioners, and stated that a monument of dressed stone, with the usual inscription, was erected on the parallel 31° 20′, three thousand eight hundred and twenty-five feet west of the San Pedro river. The maps and views were exhibited showing the exact locality of this monument. Mr. Emory stated, if the Indians had destroyed that monument it was all very well; but if it was still standing, there might be some discrepancy, amounting, possibly, to 1″ of arc, or one hundred feet between the latitude of the monu-

ment erected by Mr. Salazar and that erected under his orders. If so, it might hereafter, when the country was settled, produce confusion.

Mr. Salazar stated, that in case both existed he would take the monument erected by Mr. Von Hippel as the true boundary. Assented to by Major Emory.

The commission then adjourned, to meet at 9ʰ 30ᵐ to-morrow morning.

WASHINGTON CITY, *June* 25, 1856.

Commission met at 9ʰ 30ᵐ a. m., and the following preamble and resolution were adopted:

Whereas Señor Salazar has stated it to be within his personal knowledge that some of the monuments erected by Mr. Emory were destroyed and others mutilated by the Indians, in the short space of time elapsing between the construction of these monuments and the final inspection of them by Mr. Salazar; and whereas it appears, from the maps and views which have been drawn, that the topographical features of the country, based upon astronomical determinations, are represented in sufficient detail to enable any intelligent person to identify the line at any required point; therefore, be it

Resolved, and agreed upon in joint commission, that these maps and views, duplicate copies of which will be made—one to be deposited with the United States, the other with the Mexican government—shall be the evidence of the location of the true line, and shall be the record to which all disputes between the inhabitants on either side of the line, as to the location of that line, shall be referred; and it is further agreed that the line shown by these maps and views shall be regarded as the true line, from which there shall be no appeal or departure.

Mr. Salazar proposed, with the view of carrying out the labors to the end in the soonest time, that the detailed maps be made, one copy by each commission, on a scale of $\frac{1}{600}$, and a general map of the whole boundary on a scale of $\frac{1}{6000}$. That at the end, when the total work was done, the maps should be signed, to be given to the respective governments, and the two commissions should exchange the topographical and astronomical data by which each commission has arrived at its results in the field.

Mr. Emory stated that he had constructed the maps of the country from San Diego to the Colorado on the scale of $\frac{1}{1000}$; the projections for the maps of all the other portion were on a scale of $\frac{1}{6000}$. It would be exceedingly inconvenient, if not impracticable, to reconstruct them; he therefore proposed that Mr. Salazar's proposition should be so far modified as to leave the California section of the work to stand as it is, on a scale of $\frac{1}{1000}$. This was assented to by Mr. Salazar, and it was agreed as follows, viz:

That the detailed maps of the California section of the work shall be received on a scale of $\frac{1}{1000}$, the detailed maps for all the other portion of the boundary shall be completed on a scale of $\frac{1}{600}$, and that a general map of the boundary shall be constructed on a scale of $\frac{1}{6000}$, which maps, when completed, shall form the evidence of the true line referred to in the agreement made this day.

W. H. EMORY.
JOSÉ SALAZAR Y LARREGUI.

Lith. of SARONY MAJOR & KNAPP, New York.

PRAIRIE OF THE ANTELOPE.

CHAPTER III.

GENERAL DESCRIPTION OF THE COUNTRY.

SUITABLENESS AS A BOUNDARY.—GREAT PLATEAU OF AMERICA AND MOUNTAIN RANGES.—DEPRESSION OF MOUNTAINS NEAR THE PARALLEL OF THIRTY-TWO DEGREES NORTH LATITUDE.—GEOGRAPHICAL ERRORS.—METALLIFEROUS REGIONS.—LAKES.—SAND DESERTS.—VEGETATION AND AGRICULTURAL CAPACITY.—CHARACTER OF THE RIO BRAVO.—RAILWAY.—ASTRONOMICAL DETERMINATIONS.

The boundary between the United States and Mexico, extends entirely across the continent from ocean to ocean. That portion of it which is formed by the Rio Bravo, below the mouth of the San Pedro, or Devil's river of Texas, makes a boundary, which, in the absence of extradition laws, must always be a source of controversy between the United States and Mexico.

In other respects, the boundary is a good one; and if the United States is determined to resist what appears to me the inevitable expansive force of her institutions and people, and set limits to her territory before reaching the Isthmus of Darien, no line traversing the continent could probably be found which is better suited to the purpose.

In this respect it is fortunate that two nations, which differ so much in laws, religion, customs, and physical wants, should be separated by lines, marking great features in physical geography.

The boundary is embraced in the zone separating the tropical from the temperate and more northern regions. Here, waters unite, some of which are furnished by the melting of northern snows, whilst those from the south are supplied from mountains watered by the tropical rains. To the north of this zone, the showers from the tropics cease to refresh the earth, and within it, all the flora and fauna which characterize the northern and temperate regions almost disappear, and are not entirely supplanted by those of the tropics.

It is indeed a neutral region, having peculiar characteristics, so different as to stamp upon vegetable and animal life features of its own.

The most remarkable and apparent difference between this region and those of the States of the Union generally, and that which, perhaps, creates, as much as any other one cause, the difference in its botanical and zoological productions, is the hygrometric state of the atmosphere; for, while the plants and animals assume new forms in life, the crust of the earth, the soil, and the rocks, are everywhere familiar, and have many types, indeed fac similes, over the rest of the American continent.

It is very arid; but this is also the character of all the country north of the tropics, and west of the 100th meridian of longitude, until you reach the last slope to the Pacific—a narrow belt, seldom exceeding 200 miles in width, and sometimes not more than ten. The zone extending from the Gulf of Mexico to the Pacific, embracing the boundary, contains a large proportion of arid lands; yet this dry region is, perhaps, narrower on the line of boundary than on any portion of the continent north of it, within the limits of the United States, and is occasionally refreshed by showers in the summer season, and so far presents an advantage over the arid belt to the north.

A general description of the topographical features of the country along the boundary between the United States and Mexico, (traversing the whole breadth of the continent,) cannot be made comprehensive, without presenting in the same view the great outline of the continent itself.

It is now well known that the most extensive feature in the continent is the plateau, or table-land, which traverses this country from the unexplored region of the north to its southernmost extremity, varying in width from five miles to one thousand, attaining its greatest elevation in the Andes of South America, its least elevation and breadth on the Isthmus of Panama and in Central America, and its greatest breadth about the parallel of 38° north latitude. On the northern portion of the continent, this plateau attains its greatest height in Mexico, where it is ten thousand feet above the level of the sea. Its lowest depression is along the line of boundary, about the parallel of 32° north latitude, where it is about four thousand feet above the sea. Thence it ascends again, and preserves an elevation varying from seven to eight thousand feet, to near the 49th parallel, where it is again depressed. This plateau, both in North and South America, occupies the western side of the continent and is traversed by ranges of mountains, the highest peak of which, in North America, is Mount Elias, 17,000 feet above the sea, and in South America is Mount Aconcagua, 21,500 feet above the sea. The climatic features in this plateau, within the United States, are excessive dryness and great changes of temperature between night and day, often as much as 65°.

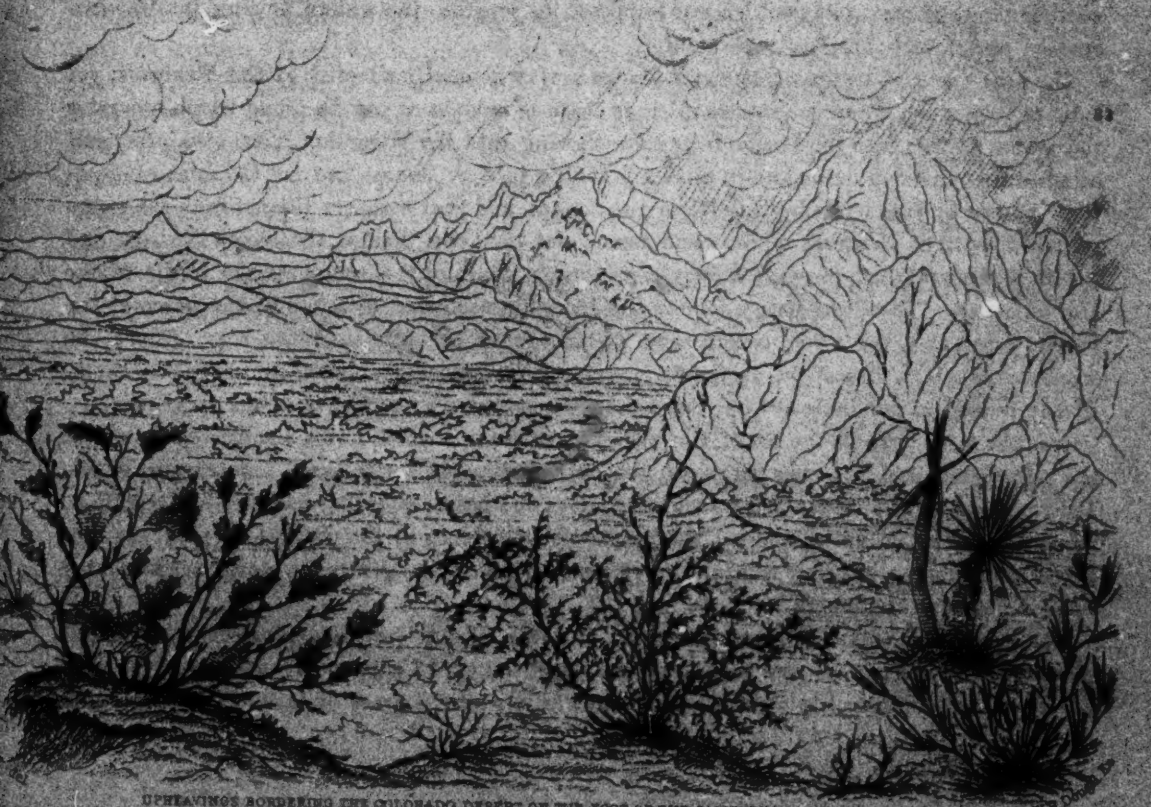
The principal ranges of these mountains in North America, naming them in the order of their proximity to the coast of the Pacific ocean, are, first, the Cordilleras of California and Oregon, or the Coast Range of mountains; second, the Sierra Nevada, (which, as its name denotes, is a ridge of mountains and craggy rocks, covered with snow;) third, the Sierra Madre, another range of mountains, which was supposed to separate the waters flowing into the two oceans; and, fourth, the Rocky mountains.

The idea conveyed by the name Sierra Madre is very generally adopted by the Mexicans, yet I doubt very much if any continuous ridge or chain of mountains can be found which separates the waters flowing into the Pacific from those flowing into the Atlantic. I am also quite well satisfied that the mountains known as Sierra Madre, in New Mexico, are not the same range as those known by that name in Chihuahua and Sonora, and that both are distinct from the range west and south of Monterey of the same name; but the Coast Range, the Sierra Nevada, and the Rocky mountains, preserve a very considerable continuity throughout the limits of the United States. The Coast Range follows the generally northwest direction of the beach of the Pacific coast, and, for a very considerable distance, rises abruptly from the sea. Along the whole coast it is in view of the navigator, presenting an imposing and ever-changing panorama. It may be said to terminate at Cape San Lucas, the southern extremity of Lower California.

It is the slope towards the sea of this range of mountains which forms the western border of the arid region, and is, in my judgment, the only continuous agricultural country west of the 100th meridian. There are many detached valleys and basins affording facilities for irrigation, where the cereals, the vine, and all the plants which conduce to the comfort of man, are produced luxuriantly; but they form the exception rather than the general rule, and are separated by arid plains or mountains.

The Sierra Nevada, the Cascade Range, and the Rocky mountains, preserve a general parallelism to each other and to that of the Coast Range. Commencing at the north, they can be traced continuously until we reach to within a few degrees of latitude of the region

VIEW TOWARDS THE EASTERN SLOPE OF THE CALIFORNIAN CORDILLERAS TAKEN FROM NEAR CARRIZO CREEK.



UPHEAVINGS BORDERING THE COLORADO DESERT ON THE FOOT OF THE CALIFORNIAN CORDILLERAS
TAKEN FROM CARRIZO CREEK - LOOKING SOUTH EAST.

of the boundary, where occurs, in all the ranges except the Coast Range, the remarkable depression in the continent, or rather absence in the continuity of the ranges of mountains, hereafter to be described.

The Sierra Nevada, in latitude 33° N., branches; one great division unites with the Coast Range, forming the elevated promontory of Lower California, and presenting, when figured on the map, the appearance of the letter Y, (Tulare valley resting in the fork of the letter;) other branches or spurs are thrown off in a southeast direction, crossing the Gila at the mouth, and many miles above, and traversing the newly-acquired territory in the meridian of Santa Cruz and Tucson.

That range, as well as the Sierra Madre and the Rocky mountains, about the parallel of 32°, lose their continuous character, and assume the forms that are graphically described in the western country as *lost mountains*—that is to say, mountains which have no apparent connexion with each other. They preserve, however, their general direction N. W. and S. E., showing that the upheaving power which produced them was the same, but in diminished and irregular force. They rise abruptly from the plateau, and disappear as suddenly, and, by winding around the bases of these mountains, it is possible to pass through the mountain system, in this region, near the parallel of 32°, almost on the level of the plateau; so that if the sea were to rise 4,000 feet above its present level, the navigator could cross the continent near the 32d parallel of latitude. He would be on soundings of uniform depth, from the Gulf of California to the Pecos river. He would see to the north and to the south prominent peaks and sierras, and at times his passage would be narrow and intricate. At El Paso he would be within gun-shot of both shores.

I noticed this remarkable depression in the continent, in an exploration made by me in 1846, and called to it the attention of Mr. Buchanan, then Secretary of State; and it was upon this information that he instructed our minister, then negotiating the treaty of Guadalupe Hidalgo, not to take a line north of the 32d parallel of latitude, in the boundary between the United States and Mexico.

Passing to the south of this parallel, in about that of 31°, we find the plateau rising rapidly to the table-lands of Mexico, the ranges above described are no longer traceable, and the plateau gives evidence of having been disturbed by tremendous plutonic forces, and the mountains assume a loftier and more rugged and diversified appearance. As I have said before, the Sierra Madre range of mountains cannot be traced distinctly with our present information.

The Rocky mountains, near the head-waters of the Rio Bravo, throw off spurs, which add to the confusion and make it difficult to separate the range from that called in New Mexico the Sierra Madre.

It may be a question whether the Rocky mountain range is not divided by the Rio Bravo; and if so, that which I have designated as the Sierra Madre of New Mexico will, in that case, become a spur of the Rocky mountains. The geological formations to which I shall presently refer, seem to favor this hypothesis. If this hypothesis be true, the Sierra Madre of New Mexico and the Rocky mountain system are the same, and are only divided by the Rio Bravo. But this is a question which does not affect the general topographical description of the country, and may be disregarded here. What I have described refers more particularly to the country west of the Rio Bravo.

The Rocky mountain system, commencing in the north, beyond the source of this river, and beyond the limits of the 49th degree of north latitude, is the distinguishing feature of the

country east of that river until we reach the great plains lying between the base of those mountains and the valley of the Mississippi. The axis of [illegible] es a general parallelism to the Sierra Nevada range. Its principal chain, after [illegible] 36th parallel of latitude, becomes less elevated, and finally disappears in the [illegible] near El Paso, re-appearing again to the south and east, and becoming [illegible] great mountain masses in Mexico.

Another branch of these mountains diverges about the head of the [illegible] outh with unequal elevation, crosses the Rio Bravo between the [illegible] ongi- tude, forming the great bend in that river, and producing one of the most remarkable [illegible] tures on the face of the globe—that of a river traversing at an oblique angle a chain of [illegible] ount- ains, and making through these, on a gigantic scale, what is called in Spanish [illegible] ica a cañon—that is, a river hemmed in by vertical walls.

Entrance to [illegible] Canon, Rio Bravo [illegible]

These mountains to the south of the river expand in [illegible] great elevation in the neighborhood of Monterey, Saltillo, and [illegible] of the Bolson Mapimi, and it is my impression that these [illegible] called in Nuevo Leon the Sierra Madre.

A third, but subordinate range, branches from the [illegible] allel as that last described, and terminates in the Llano Estacado or [illegible] h issue the Red river and other rivers of Texas. From the [illegible] country falls, sometimes by steps, but most generally by gentle [illegible] Gulf of Mexico, the crust only broken by the washing of water, [illegible] trusion of igneous rocks. The view of the bed of Devil's river [illegible] of the manner in which the general level of the surface [illegible] broken by the action of water.

RIO SAN PEDRO — ABOVE SECOND CROSSING

The igneous protrusions which occur are composed of greenstone or basalt, and are traced from the San Saba mountain, by the head of the Leona, to Santa Rosa, in Mexico, where it unites with the main ridge, at an angle of about forty-five degrees. The point where they unite is rich in silver mines. At Santa Rosa the Spaniards had sunk extensive shafts and made a tunnel a mile and a half in length, which was not completed when the revolution of 1825 broke out; since then all extensive operations have been suspended, and the country, rich in minerals and in the production of the cereals and of tropical plants, has been a prey to the incursions of banditti and Indians, and at this time Wild Cat and his band of Florida Indians are settled near there, to add to the disorder and misrule of this beautiful region.

It has been observed that these metalliferous rocks generally occur at the junction of two systems, or where some unusual disturbance or change in the geological structure takes place. Hence we may expect to find these silver-bearing rocks along the boundary line, where the upheaving force, after subsiding near the bed of the Gila river, begins again to re-appear to the south.

The remaining mountain feature of North America, the Appalachian, is referred to here, only to illustrate by comparison the mountain system of the western part of the continent. That chain, grand as it is, sinks into insignificance when compared to those I have attempted to describe. It is nearly at right-angles to the western chain of mountains, is less elevated, and sheds its waters, as is well known, clear on both sides; on the one side into the Atlantic, and on the other side into the Mississippi and the Gulf of Mexico. On both sides, the slopes are comparatively gentle, and the soil fertile, and, refreshed by frequent showers, yields in abundance all that contributes to the wants of man; on the western side of this slope, between it and the desert border of the Rocky mountains, such an expanse of fertile country exists as can be found, in one body, nowhere else on the face of the globe, producing all the fruits of the earth, including those found in every zone, from the boreal regions to the tropics. Persons familiar with its character, as most who read this memoir are, will scarcely be able to comprehend, still less to believe, the character given to the more western and less favored regions described in this report.

In the fanciful and exaggerated description given by many of the character of the western half of the continent, some have no doubt been influenced by a desire to favor particular routes of travel for the emigrants to follow; others by a desire to commend themselves to the political favor of those interested in the settlement and sale of the lands; but much the greater portion by estimating the soil alone, which is generally good, without giving due weight to the infrequency of rains, or the absence of the necessary humidity in the atmosphere to produce a profitable vegetation. But be the motive what it may, the influence has been equally unfortunate by directing legislation and the military occupation of the country, as if it were susceptible of continuous settlement, from the peaks of the Alleghanies to the shores of the Pacific.

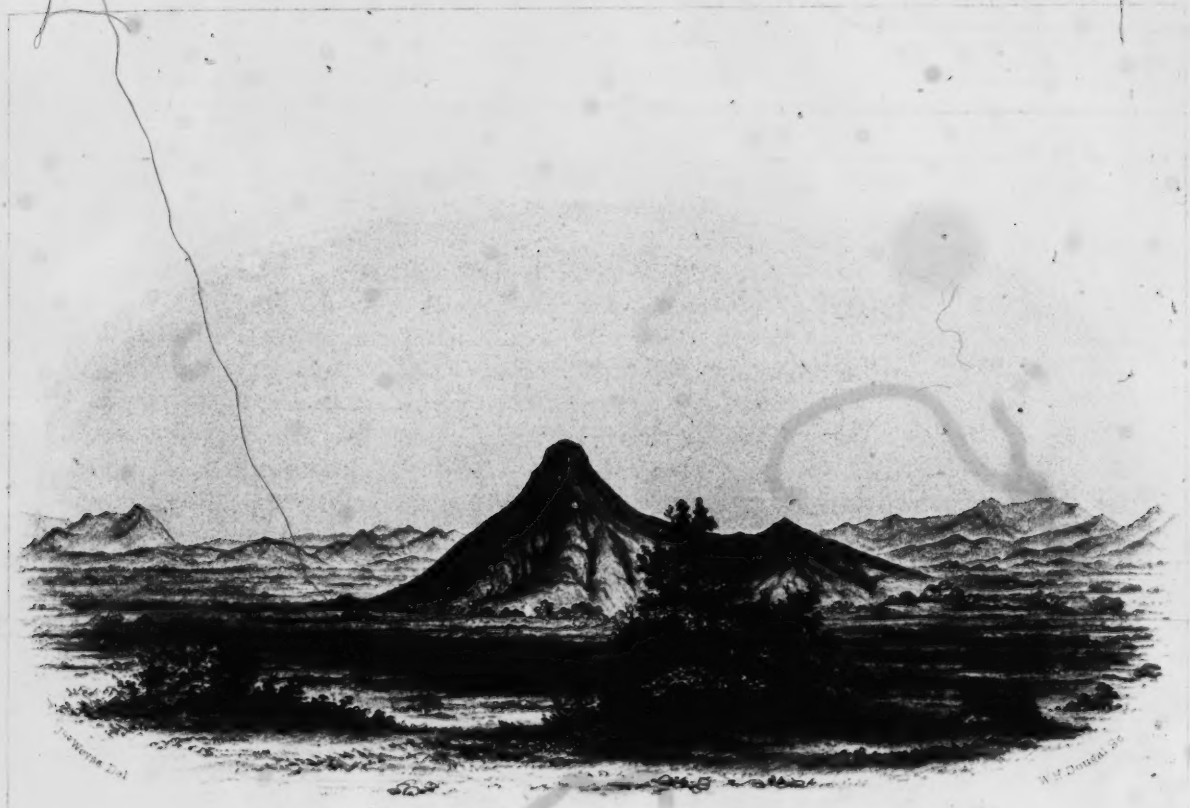
Between the two most distinctly-marked ranges of mountains, before described, (the Rocky mountains and the Sierra Nevada,) a succession of minor ranges occur, some of which are many hundred miles in extent, while others appear like isolated mountains, rising above the general level of the plateau. Most of them preserve a general system of parallelism; others present their lines of maximum elevation, forming very considerable angles with the general direction, and all, when traced upon a map, exhibit lines varying from right lines to every degree of curvature.

The whole system, plateau and mountain, seems to have been produced by a succession of forces analogous to each other in direction, but differing in intensity and occurring at long intervals. The prevalence of granite and other unstratified rocks throughout the Sierra Nevada suggests the probability of its being the oldest of the western range of mountains. The identity of its rocks, generally, with those of the Alleghany mountains, marks these two distinct and detached chains as probably contemporaneous. The rocks marking these mountains are of the description commonly traversed by gold and copper veins, as is the case in Oregon, California, Virginia, and North Carolina. Travelling eastward from the Pacific along the bed of the Gila, we encountered similar rocks in a chain of mountains as far east as the Pimo village. This chain, characterized also by the presence of gneiss, mica, and talcose slate, has been traced as far south as the present boundary, where it crosses the Santa Cruz river, between longitude 110 and 111; and in that neighborhood we saw everywhere the remains of gold mines, from which the operators had been driven by the Apaches.

Pursuing our course eastward along the boundary from the meridian of 110°, we cross the San Pedro, the Guadalupe, and the San Luis range of mountains in the order in which they are named, the middle range being chiefly characterized by sienitic aggregates, granitic lava, and immense masses of conglomerate, or breccia. Precisely the same formation is found in the cañon of the Gila, some distance to the north, about the meridian of what is called, in my reconnoissance of 1846, Disappointment creek. And no doubt, when future surveys shall develop a more minute knowledge of the physical geography of the country, each of these ranges of mountains will find its equivalent to the north and to the south. With the present information, I shall not even attempt to connect them conjecturally.

Hypothetical geography has proceeded far enough in the United States. In no country has it been carried to such an extent, or been attended with more disatrous consequences. This pernicious system was commenced under the eminent auspices of Baron Humboldt, who, from a few excursions into Mexico, attempted to figure the whole North American continent. It has been followed by individuals to carry out objects of their own. In this way it has come to pass, that, with no other evidence than that furnished by a party of persons travelling on mule-back, at the top of their speed, across the continent, the opinion of the country has been held in suspense upon the subject of the proper route for a railway, and even a preference created in the public mind in favor of a route which actual survey has demonstrated to be the most impracticable of all the routes between the 32d and 33d parallels of latitude. On the same kind of unsubstantial information maps of the whole continent have been projected and engraved in the highest style of art, and sent forth to receive the patronage of Congress, and the applause of geographical societies at home and abroad, while the substantial contributors to accurate geography have seen their works pilfered and distorted, and themselves overlooked and forgotten.

The San Luis mountains, a distant view of which is given from the Alamo Hueco springs looking west, rise abruptly from the plains about three leagues north of the parallel 31°.20, and, as they run south, assume by far the most formidable appearance of any range, on that parallel, west of the Rio Grande. They are called, in Sonora and part of Chihuahua, the Sierra Madre mountains, yet they do not fulfil entirely the conditions implied by that term, for I am credibly informed that the waters flowing from their base towards the Pacific coast often take their rise to the east of these mountains, and flow through chasms impassable for men, and fall down the western slope in rapid descent, producing sublime and picturesque cascades.



OJOS DE LOS ALAMOS VIEJOS

It was not in my power to explore this range to the south, but I was informed by persons worthy of confidence, that throughout its whole extent, as far south as the parallel of Mazatlan, it was utterly impassable for wagons, and there was no possibility of finding, south of 31° 20′, a line for a railway. The report of its impracticability for wagons was confirmed by the fact that the Camino real, (highway,) established by the Spaniards to connect Chihuahua and Guymas, makes a great circuit, and passes to the north of 31°.20, and within what is now the territory of the United States.

This stupendous range of mountains, which drops so abruptly a few miles north of the boundary, as if to make room for the highway which is to connect the Pacific and Atlantic States, no doubt, reappears to the north, in the neighborhood of the Gila, but our information is not yet sufficient to establish the connexion. I am quite satisfied of one thing, however; its equivalent is not to be found in what is called the Sierra Madre, in New Mexico.

Pursuing our course still eastward, we pass over wide plains bounded by detached ranges of mountains of metamorphic and other limestones, associated with igneous rocks, rich in silver and lead, and at El Paso we encounter the western flank of the third great mountain chain, the Rocky mountains, known in that particular locality as the Organ mountains; and at intervals of about eighty miles we cross two other ranges, the Eagle Spring mountains and the Limpia range of mountains.

The view will give a very good idea of the appearance of the Organ mountains in the distance, and of the Great Mesa, which reaches far away to the west. It is from the bed of the Rio Bravo, just above the gorge, where the river breaks through the range at El Paso.

These three chains of mountains appear to be spurs of the Rocky mountains, and are characterized by the presence of carboniferous limestone, greatly disturbed by igneous protrusions of what Professor Hall characterizes as of "comparatively modern origin."

And throughout this whole region, the carboniferous and metamorphic limestone is not unfrequently traversed by rich seams of argentiferous lead ore. Between the San Luis range and the Organ mountains, the first of the Rocky mountain range, the metamorphism of the rocks is so complete and the irruptive lines so frequent, and protrusion above the crust of the earth so detached, it is impossible to say, with our present information, where the one begins or the other ends, or whether they do not all belong to the same system.

It is between these two ranges, upon the banks of the Janos river, that we discover the first evidences from the west of that vast cretaceous formation which has been traced from the 108th to the 101st meridian of longitude, and as far north as the Great Salt Lake, and south to the 25th parallel of longitude.

The western limit of this formation, discovered by the boundary survey, is the basin of the Janos river in Chihuahua, and its easternmost limit San Antonio, in Texas. How far it extends north and south has never been ascertained, but it has been traced in one direction as far as the Big Salt Lake of Utah Territory.

Granite, and its associated gold-bearing rocks, occur sporadically throughout the Rocky mountain chain, and its spurs; but the distinguishing feature, in an economical point of view, is the prevalence of carboniferous limestone, with which is found associated argentiferous galena.

Silver mines of richness have been discovered, and some of them worked to a limited extent, in the mountains about Tucson, at Barrancas, Presidio del Norte, Wild Rose Pass, in the Organ mountains, and other localities, accounts of which will be found elsewhere.

Gold mines have been worked at the Calabasas, on the Santa Cruz river, and in the mountains of New Mexico, on both sides of the Rio Bravo.

It will not be extravagant to predict the discovery of many localities where silver mines can be worked to advantage throughout the whole region where carboniferous limestone exists, extending on the line of boundary from the great bend of the Rio Bravo, in Texas, to the meridian of the San Luis range. Should this conjecture prove true, we shall have then, in abundance, the only commodity in which we are now deficient, and for which we are at all dependent upon any other country.

Another argentiferous region of exceeding richness, and, I think, one wholly disconnected from the other, is in the basin west of the Santa Cruz river, between that river and the Gulf of California. Veins of metal were discovered traversing a coarse sandstone, which will be more particularly referred to in Chapter VI on that section of the boundary.

I have stated that the eastern portion of the continent, with which we are familiar, is entirely different in its physical geography from the western, and among the distinguishing features of the first is the Appalachian chain of mountains, which sheds its waters clear from the summit to the ocean; that is to say, water once above the surface at any point, continues to flow in that position until it reaches tide-water.

Between the two great chains, which I have attempted to describe, occupying the western portion of the continent, there are other chains of mountains, so numerous that it is impossible to describe them by words; some are continuous, some are detached ridges, others isolated peaks, rising from the plateau almost with the uniformity and symmetrical proportions of artificial structures. Between them are found basins, which have no outlets to the ocean, but are the receptacles of the drainage of the surrounding water-sheds. Of these, the most extensive is the Great Salt Lake in Utah Territory, and the most remarkable for its historical associations and present importance is the valley of the city of Mexico.

These successions of basins form a prominent feature in the geography of North America, extending two-thirds its length, and quite one-third its breadth. They belong to what has been appropriately designated as the Basin system of North America.

Those found near the boundary are Santa Maria, Guzman, and Jaqui—all to the south of the boundary, and within the limits of Mexico. The first is fed by the waters of the river Santa Maria, which runs in a northern direction, and Guzman by the river bearing the several names of Casas Grandes, San Miguel, and Janos, the general course of which is also from the south to the north; and the waters of Lake Guzman and Lake Santa Maria are said to unite in seasons of unusual freshets.

The waters of the Rio Mimbres, near the same meridian as Lake Guzman, which take their rise near the Santa Rita del Cobre, run towards that lake, but they disappear in the plain to the north of the boundary, before reaching it.

The waters of these lakes, or inland seas, are brackish at all times, but in seasons of drought, which last two-thirds of the year, they become salt, and wholly unpalatable. Their shores are covered with lacustrine deposites, and are usually unsuited to cultivation. The waters of these vast basins are not all locked up, however, by the mountains. Three great rivers, with their tributaries, have made their way in different directions to the ocean, cutting, in their passage, gigantic chasms in the mountains. These rivers are the Colorado, the Colorado of the West, and the Rio Bravo. Another river, the Gila, drains this plateau, cutting the mountains nearly at right angles, which, although a tributary of the Colorado, joins it near its

RIO GRANDE.—NEAR FRONTERA.

mouth, and at an elevation so little above the sea, that it may, in a general description, be considered a separate and independent drainage.

Another feature of this basin system remains to be described, which is also common to all the rest of the mountain regions occupying the plateau, and the region lying east of the Rocky mountains. Between the ridges of mountains the traveller occasionally encounters vast plains, which, when the sun is above the horizon, producing the phenomenon of the mirage, present to him all the appearance of the sea. The plain bounds the view, and the line of the horizon is broken into waves, resembling, in appearance, the edge of the Gulf Stream, when seen from the deck of a vessel ten or fifteen miles distant. The plains are clothed with vegetation of a scrubby growth, incapable of affording subsistence to any but a class of small animals, such as antelope, prairie-dogs, and rabbits. Most generally, however, in the southern part of the United States, these plains are clothed with a luxuriant growth of "grama," the most nutritious of all the grasses. Sometimes they are destitute of all vegetation, except the larrea Mexicana, the yucca, the cactus, and other spinous plants, and are paved with minute fragments of chalcedony, basalt, agate, and other hard rocks. Occasionally in these plains we encounter sand-dunes, called by the Spaniards *medanos*, extending over a large area of country, and encircling what might at first sight be supposed the shores of dried-up lakes. But an examination of the sand with a microscope of sufficient power, dispels this idea. The grains seem to be angular, and are not rounded by the attrition of water. An extensive formation of this kind occurs between the Rio Colorado of the West and the base of the Sierra Madre, and extends many miles along almost the whole extent of the western coast of the Gulf of California. Another very extensive waste of sand lies to the south of the Arkansas river; a third is traversed by the Platte river; and a fourth, which has come under my notice, less in extent, lies to the south of the Rio Bravo, on the road from El Paso to the city of Chihuahua.

The plains or basins which I have described as occurring in the mountain system, are not the great plains of North America which are referred to so often in the newspaper literature of the day, in the expressions, "News from the plains," "Indian depredations on the plains," &c.

The term "plains" is applied to the extensive inclined surface reaching from the base of the Rocky mountains to the shores of the Gulf of Mexico and the valley of the Mississippi, and form a feature in the geography of the western country as notable as any other. Except on the borders of the streams which traverse the plains in their course to the valley of the Mississippi, scarcely anything exists deserving the name of vegetation. The soil is composed of disintegrated rocks, covered by a loam an inch or two in thickness, which is composed of the exuviæ of animals and decayed vegetable matter. The growth on them is principally a short but nutritious grass called buffalo-grass, (Sysleria dyctaloides.) A narrow strip of alluvial soil, supporting a coarse grass and a few cotton-wood trees, marks the line of the water-courses, which are themselves sufficiently few and far between.

Whatever may be said to the contrary, these plains west of the 100th meridian are wholly unsusceptible of sustaining an agricultural population, until you reach sufficiently far south to encounter the rains from the tropics.

The precise limit of these rains I am not prepared to give, but think the Red river is, perhaps, as far north as they extend. South of that river, the plains are covered with grass of larger and more vigorous growth. That which is most widely spread over the face of the country is the grama or mezquite grass, of which there are many varieties. This is incomparably the most nutritious grass known.

South of the Red river, also, the plains are not unfrequently covered with a growth of mezquite trees, (algaroba,) of which there are many varieties. This tree varies in size according to the character of the soil and quantity of rain. It is usually from fifteen to thirty feet in height, crooked, gnarled, and armed with thorns. The wood is hard and full of knots, and is unfit for purposes of carpentry, but in other respects it fulfils many of the economical uses of life. It is excellent firewood, and makes good posts, being very durable. It exudes a gum which is equal to gum-arabic, but to the traveller its most important quality is the fruit which it bears—a nutritious bean, much relished by animals, and not wholly unsuited to the tastes of man.

The vegetation of the mountain and basin region, while it differs materially in the genera and species of plants according to the locality, possesses, nevertheless, a general similarity which is striking and peculiar. I have described that of the plateau or levels as consisting of a diminutive growth of shrubs; but as we ascend from these to the heights of the surrounding mountains we pass through a succession of floral products, varying in character according to the elevation to which we ascend, until we reach a sub-Alpine flora. North of the parallel of 32° this appears at the height of about six thousand feet above the sea.

In situations protected from the winds we usually find, at this height, pines and cedars, and at a less elevation different varieties of oak. Wherever this region is traversed by water-courses, cotton-wood and occasionally sycamore grow on the edges of the streams. There are throughout this region, on the sides of the mountains, growths of pine, oak, and cedar, which are quite extended and present a forest-like appearance, but nowhere, until we begin to descend the Pacific slope and get within the influence of the humidity from the ocean, do we encounter timber at all approximating in size or luxuriance of growth the forests with which we are familiar in the basin of the Mississippi and the eastern slope of the Alleghanies. The Pacific slope, including the water of the Sacramento and its tributaries below the Cascade range, and Puget sound and its tributaries, it is not my intention to describe in this general sketch, or the memoirs which follow, further than to say that, refreshed by frequent showers and fogs from the ocean, it presents a different and more inviting picture than the country to the east of it. It is on this slope that we find that stupendous growth of red-wood, the accounts of which appear almost fabulous. We find here, too, in all that region north of Monterey, considerable adaptation, both in soil and climate, to the production of the cereal plants. About Santa Barbara, in parallel 34° north latitude, the mountains run to the sea; thence the coast deflects sharply to the east; and below, or south of this point, the trade-winds, which sweep along the Pacific coast, charged with humidity for nine months in the year, from as far north as the Aleutian islands, seem to diminish in force, and finally die away, at the lowest extremity of California. The mountain range at Santa Barbara cuts off these humid winds from the land to the south of them; and it is my opinion, that on the Pacific slope beyond this point, and until we reach the region of the tropical rains, no crops can be raised with anything like certainty without irrigation. South of this range, the agricultural character of the country is much the same as that of the mountain and basin systems, and this character is retained along the coast until we reach the parallel of Mazatlan, where the tropical rains begin to be felt in great force. For the four months (July, August, September, and October) during which I kept a meteorological record at Camp Riley, no rain fell in sufficient quantity to be measured. The mean height of the barometer for that period was 29.853, the thermometer 68.37, and the mean dew-point 58.13.

There are considerable portions of the extensive mountain system which I have attempted to

describe, where wheat and rye can be raised without irrigation; but these portions are exceptions to the general rule; and I think I am safe in stating, that as a general rule throughout this vast region, corn, cotton, and vegetables cannot be produced without irrigation; and furthermore, the limits of the ground which can be brought under the effects of irrigation are very circumscribed. The town of El Paso, in latitude 31° 44′ 15″.7, and longitude 106° 29′ 05″.4, is considered, and justly so, one of the garden-spots of the interior of the continent. A meteorological record was kept at Frontera, a few miles north of this point, for two years, by assistant Chandler, the results of which are embodied in the diagram herewith presented.

From this it will be seen how very dry the climate is, and how unsuited for agricultural purposes, according to the notion entertained of farming in the eastern States. The settlements about El Paso are irrigated by the Rio Bravo, and are happily not dependent on rains for their fertility.

Whatever population may now, or hereafter, occupy the mountain system, and the plains to the east, must be dependent on mining, or grazing, or the cultivation of the grape. The country must be settled by a mining and pastoral or wine-making population; and the whole legislation of Congress, directed heretofore so successfully towards the settlement of lands east of the 100th meridian of longitude, must be remodeled and reorganized to suit the new phase which life must assume under conditions so different from those to which we are accustomed.

Southern California, the whole of the upper valley of the Gila, and the upper valley of the del Norte, as far down as the Presidio del Norte, are eminently adapted to the cultivation of the grape. In no part of the world does this luscious fruit flourish with greater luxuriance than in these regions, when properly cultivated. Those versed in the cultivation of the vine represent that all the conditions of soil, humidity and temperature, are united in these regions to produce the grape in the greatest perfection. The soil, composed of the disintegrated matter of the older rocks and volcanic ashes, is light, porous, and rich. The frosts in winter are just sufficiently severe to destroy the insects without injuring the plant, and the rain seldom falls in the season when the plant is flowering, or when the fruit is coming to maturity, and liable to rot from exposure to humidity. As a consequence of this condition of things, the fruit, when ripe, has a thin skin, scarcely any pulp, and is devoid of the musky taste usual with American grapes.

The manufacture of wine from this grape is still in a crude state. Although wine has been made for upwards of a century in El Paso, and is a very considerable article of commerce, no one of sufficient intelligence and capital, to do justice to the magnificent fruit of the country, has yet undertaken its manufacture. As at present made, there is no system followed, no ingenuity in mechanical contrivance practised, and none of those facilities exist which are usual and necessary in the manufacture of wine on a large scale; indeed, there seems to be no great desire beyond that of producing as much alcoholic matter as possible. The demand for strong alcoholic drinks has much increased with the advent of the Americans; and in proportion as this demand has increased, the wine has decreased in quality. On one occasion I drank wine in El Paso which compared favorably with the richest Burgundy. The production of this wine must have been purely accidental, for other wine made of the same grape, and grown in the same year, was scarcely fit to drink. Cotton and corn grow with luxuriance, where water can be brought to irrigate the soil, throughout the valleys of the Gila and Rio Bravo, and upon the lower Rio Bravo; and upon the Rio Colorado, below its junction with the Gila, sugar-cane flourishes.

It sometimes happens that the irrigation is produced by natural causes—the overflow of the river. This is the case in the basin of the Presidio del Norte, and on most of the country susceptible of tillage in the valley of the lower Rio Bravo. Crops depending upon this mode of irrigation are very uncertain, the overflows of the river being very unequal as to time and extent. In some portions, however, of the Rio Bravo there are two overflows. This is the case at the Presidio del Norte, below the junction of the Conchos river. The first overflow occurs in June, from the melting of the snows near the head of the Rio Bravo, in latitude 36° 37′; the second occurs in August, from the tropical rains which fall on the mountains near the sources of the Conchos, in latitude 26° 28′.

This occurs to a limited extent on the lower Rio Bravo, which is principally supplied in the summer months by its tributaries—the Salado, the San Juan, &c. These take their rise in the mountains to the south, within the regions of tropical rains. How far the lower Rio Bravo is supplied by the melting of the snows at the head of the river, I am not prepared to say; but I am inclined to the opinion that, before reaching the tertiary region near the mouth of the river, most of the waters from that source are expended either by evaporation or absorption. In the intermediate portion of the Rio Bravo, that lying between Valverde, north of which the river is kept running by the melting of the snows throughout the summer, and the Presidio del Norte, where the Conchos joins it, and supplies it with water from the tropics, great inconvenience is felt for water in years of unusual drought. I was informed, on good authority, that in the summer of 1851 a man drove a gang of mules along the bed of the river from the Presidio del Norte to El Paso. The bed was dry for nearly the whole distance, occasional pools of water standing in places where the river-bed was formed of rock or clay, impervious to water. It was always possible, however, to procure water in sufficient quantities for drinking or watering animals by digging in the river-bed a few feet below the surface.

It might be expected in this report that I should say something of the practicability of a railway route to the Pacific through the newly-acquired territory; and it was my intention to do so, but the subject has been so ably and thoroughly examined and discussed by the Secretary of War, and the officers of the Topographical Engineers acting under his orders, as to leave nothing more to be said. All the topographical and other knowledge bearing on the subject which has been acquired by the boundary survey has been freely placed at the disposal of the War Department. The signal ability with which that information and the information acquired by the surveys specially ordered for the purpose have been collated, leaves nothing for me to say, except that our information fully sustains the conclusions of the War Office report; and it is decided, beyond all question, that a practicable, and, indeed, a highly advantageous route, from the upper basin of the Rio Bravo to the valley of the Gila, exists through the new territory.

It has already been stated, as one of the facts elicited by this and previous surveys, that if the sea were to rise four thousand feet, a vessel could pass from the Gulf of California to the Gulf of Mexico, near the parallel of 32°, and that north of that parallel no good road even for wagons could be found, uniting the valleys of the Bravo and Colorado rivers. This remarkable fact was noticed by me in a reconnoissance made in 1846–'47, and was first brought to the notice of the government through Mr. Buchanan, then Secretary of State, who immediately sent a despatch to our minister in Mexico, indicating that no boundary north of that parallel of latitude should be accepted. The treaty of Guadalupe Hidalgo, however, fixed a line north of that parallel, which cut off entirely the communication by wagons between the two rivers;

and leaving out of view the consideration involved in securing a railway route to the Pacific, it was a line which must sooner or later have been abandoned. No traveller could pass, nor could a despatch be sent, from a military post on the Rio Bravo to one on the Gila without passing through Mexican territory.

I again called the subject to the attention of the government in a letter dated San Diego, April, 1850, which has been already given, in the hope that the United States commissioner might succeed in torturing the treaty of Guadalupe Hidalgo to embrace a practicable route. That letter, however, received no attention, and I am now of the opinion that the Mexican commissioner was so impressed with the importance of the advantage to his government of making a boundary which would not only exclude the railway route, but which would cut off the communication between our military posts in New Mexico, on the Rio Bravo, and those we might establish on the Gila, that any attempt to construe the words of the treaty so as to embrace the railway and wagon route would have been abortive.

It was a great mistake to suppose, as was urged at the time, that the line projected and claimed by the United States surveyor, in opposition to that agreed to by Mr. Bartlett, gave the United States this route. Subsequent surveys have entirely sustained what I have stated on this subject in the letter to the Secretary of the Interior, dated Fort Duncan, which will be found in the first chapter of this report.

The report of Lieut. Parke, who made the recent survey for the railway route over this portion of the country, fully confirms the opinions expressed by me of the practicability of the route; and he has further reported, as the result of his examinations, that the San Pedro river offers the best route by which to descend to the Gila from the table-lands west of the Rio Bravo. I went so far only as to indicate it as a practicable route. Lieut. Parke gives it the preference above all others; and the most prominent of the reasons he assigns, is the important fact that this route affords water in abundance, and traverses valleys capable of continuous settlement.

It is no part of my business to criticise the blunders made in the treaty of Guadalupe Hidalgo, or to defend the provisions of the treaty of December, 1850; but it is undeniable that the last treaty has secured to us what before did not exist—a means of communication between the military establishments on the Rio Bravo and those on the Gila; and what is more important, it has secured what the surveys made under the orders of the War Department demonstrate to be the most feasible if not the only practicable route for a railway to the Pacific. But the importance of these considerations is very little when compared to the important pecuniary consideration secured by the same treaty, in the revocation of the 11th article of the treaty of Guadalupe Hidalgo. That article made it incumbent on the United States to keep the Indians living within our own territory from committing depredations on the Mexicans, and, by implication, imposed on the United States the obligation of indemnity for all losses resulting from failure to carry out the provisions of the treaty.

No amount of force could have kept the Indians from crossing the line to commit depredations, and I think that one hundred millions of dollars would not repay the damages they have inflicted. Whole sections of country have been depopulated, and the stock driven off and killed; and in entire States the ranches have been deserted and the people driven into the towns.

It is true, all this has not been done since the war, and would form no just claim against the United States; but those conversant with the history of Mexican claims against the United States will at once admit that the United States would have been fortunate if she could have escaped with paying real claims for depredations, whether committed before or after the war. I

should not be true to history if I did not state what is within my own personal knowledge—that companies were formed, and others forming, composed of persons of wealth, influence, and adroitness, who projected extensive schemes for the purchase of these claims, with the view of extorting them from the Congress of the United States.

I have said nothing in this sketch of the races of men which inhabit this vast western region. I have attempted only to present such a general view of the country as will prepare the reader for the more detailed description of each portion of the boundary line, and the memoirs of the assistants on the separate branches of geology, botany, and zoology, and the ethnographic information which will be found in the local geographical descriptions.

I give in its proper place a table of latitudes and longitudes determined by myself and assistants, and also those determined by others, which have been used in the projection of the general map which accompanies this memoir.

The mode in which these determinations have been made will form the subject of a separate chapter. It will be sufficient to state here, that the important points in the boundary have all been determined by the largest and most improved portable instruments—the latitudes with forty-six inch zenith telescopes, by Troughton & Simms, of London, and the longitudes by moon culminations, observed with telescopes of equal power. As the occasion for taking these large instruments into the interior of the continent, thousands of miles from navigable streams, will perhaps not again soon occur, I have aimed to produce results which would inspire sufficient confidence to make the determinations on the boundary the base of future and minor surveys in the interior of the continent. It has been suggested to me that all the astronomical, magnetic, and hygrometric observations should be published, particularly the observations on the moon and the moon culminating stars; but these alone would form a volume as large as the volume of observations made at the royal observatory at Greenwich, published annually.

The results of the observations made by me and under my orders, as fast as attained, have been given freely to all who asked for them; but I regret they have been used in several notable instances by officers of the government, and others, without due acknowledgment to myself or my assistants.

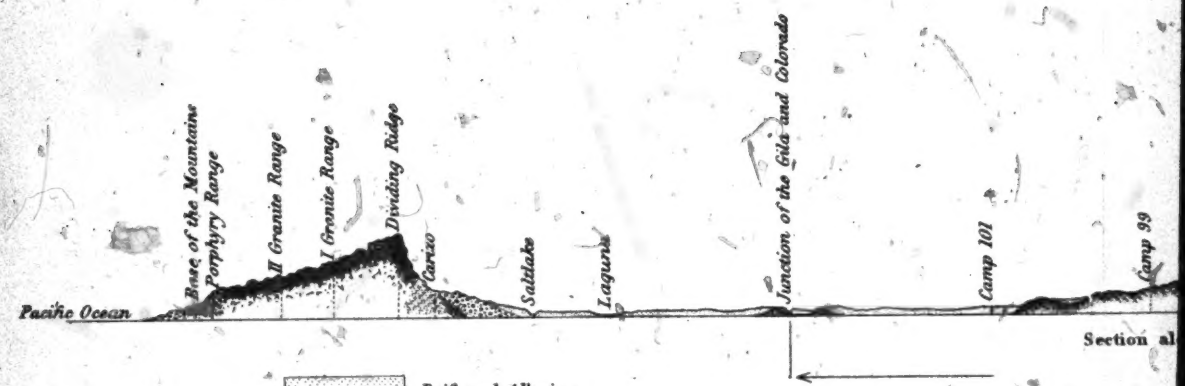
The best excuse that can be offered for such plagiarists is their ignorance of the labor, privation, self-denial and exposure incurred in the accurate determination of a single point in those far distant regions.

At none of the cardinal points have less than three lunations been used in the determination of longitude, and six nights for that of latitude.

Arthur Schott del.

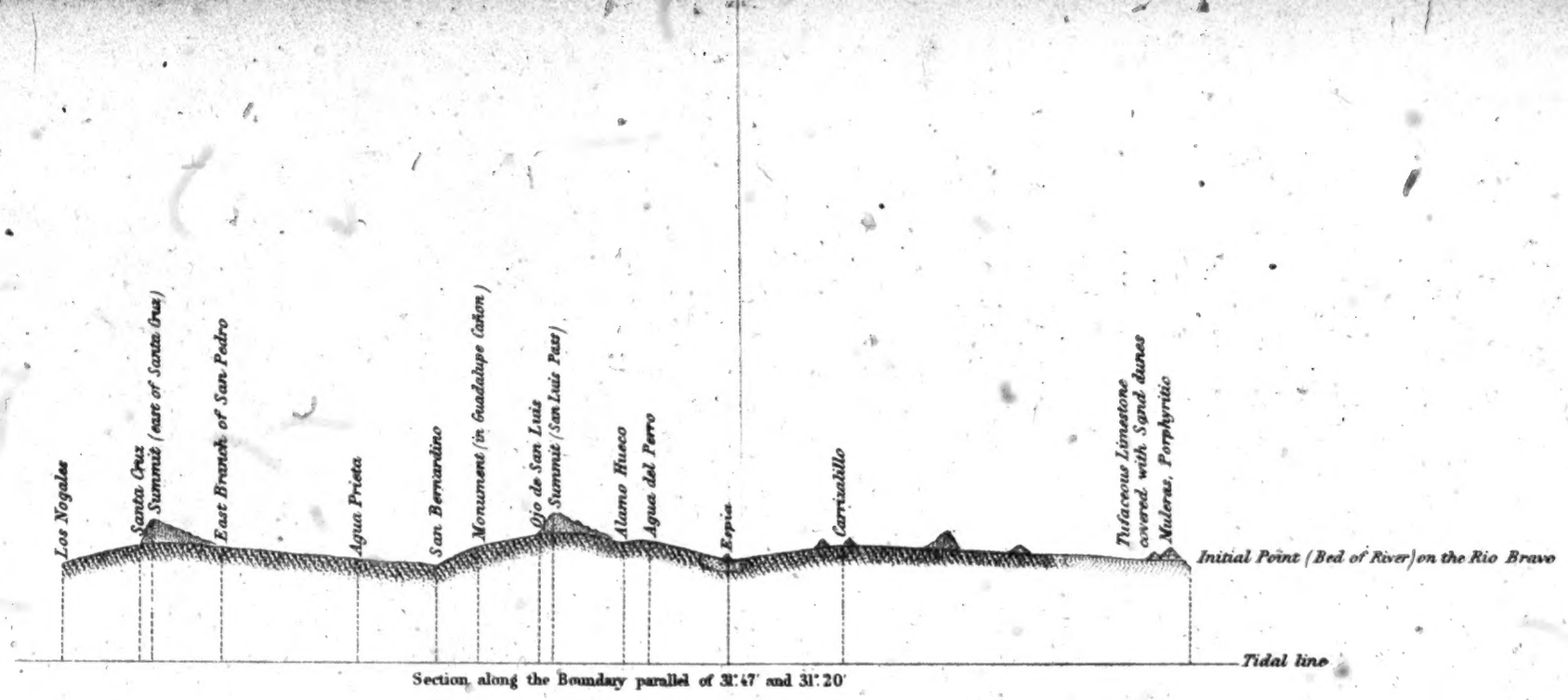
Lith. of Sarony & Cº New York

NOCO-SHIMATT-TASH-TANAKI
GRIZZLY BEAR
SEMINOLE CHIEF

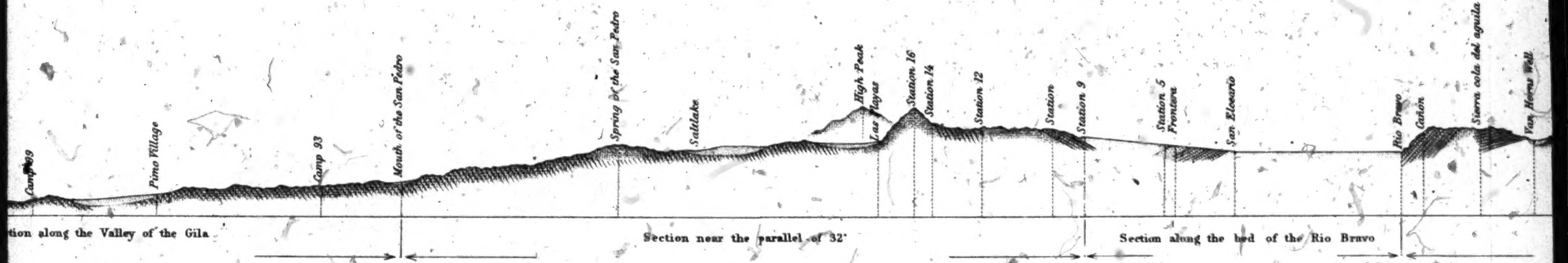


Drift and Alluvium
Tertiary
Cretaceous
Palaeozoic
Metamorphic
Igneous and Metamorphic
Igneous

Horizontal Scale – 40 Miles to one inch
Vertical Scale – 6000 feet to one inch



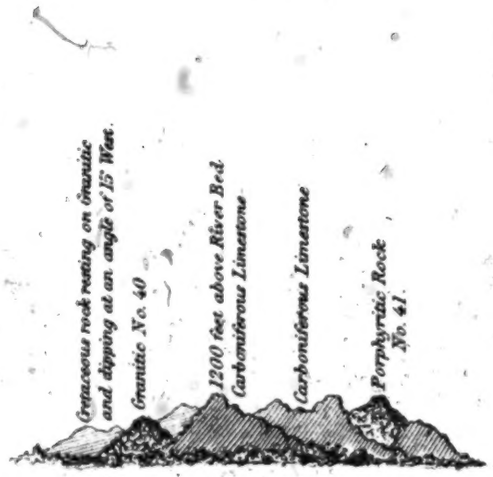
Section along the Boundary parallel of 31° 47′ and 31° 20′



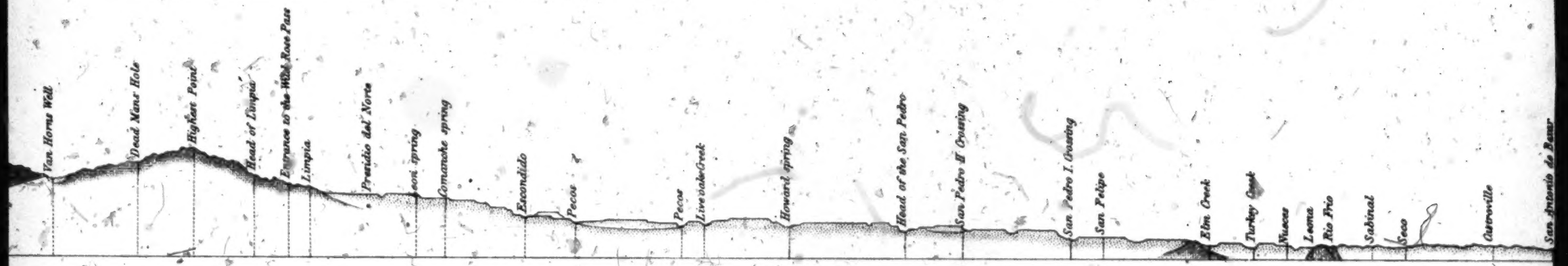
tion along the Valley of the Gila

Section near the parallel of 32°

Section along the bed of the Rio Bravo


Cretaceous rock resting on Granitic and dipping at an angle of 15° West.
Granitic No. 40
1200 feet above River Bed.
Carboniferous Limestone
Carboniferous Limestone
Porphyritic Rock No. 41.

Geological sketch of Mountains East of the Rio Bravo as seen from El Paso



Section along the road from Indianola to El Paso

SECTION

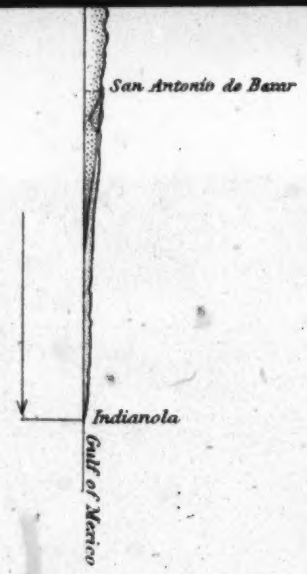
constructed from Surveys under the direction of

W. H. EMORY, U.S. Commissioner.

The Geological character of the formations

determined by C.C. PARRY

from collections made on the Survey.


San Antonio de Bexar
Indianola
Gulf of Mexico

CHAPTER IV.

LOWER RIO BRAVO.

BRAZOS SANTIAGO AND MOUTH OF RIO BRAVO AS PORTS OF ENTRY.—POINT ISABEL.—PALO ALTO.—RESACA DE LA PALMA.—COAST.—HURRICANES.—TIMBERED BELT.—COUNTRY WEST OF RIO NUECES.—MUSTANGS.—BURRITA.—BROWNSVILLE.—FILLIBUSTERING.—REYNOSA.—RINGGOLD BARRACKS.—ROMA.—POPULATION.—ISLANDS.—RIO SALADO AND BELLEVILLE.—LOREDO.—RAPIDS.—FORT DUNCAN.—SPANISH RULE AND MISSIONS.—AMALGAMATION OF RACES.—DEVIL'S RIVER.—NAVIGATION.—CAÑONS.—MEXICAN SIDE.—STATISTICS.—DISTANCES.

The general view which I have attempted to sketch of the region traversed by the boundary, will prepare the reader for the more minute description of the different sections of the country, and the individual reports of the assistants. It will not be convenient to arrange these sections in the order in which the work was pursued, nor to follow the order in which the general view was presented, commencing on the Pacific, and ending on the Gulf of Mexico. The order has been reversed. The first section embraces the lower Rio Bravo, from its mouth up to its junction with Devil's river; the second, the Rio Bravo, from the mouth of Devil's river to the initial point of the treaty of 1853, in the parallel of 31° 47′; the third, the line west to the intersection of the 111th meridian; the fourth, the line thence to the Pacific.

It will be remembered that I stated in the Personal Account, that in the year 1852, while engaged under the old commission, I found it necessary to suspend the work after bringing it as far down the river as Loredo. The following year, under a new appropriation by Congress, and a new organization, I sailed from New Orleans in the month of May, in a miserable steamer, for the mouth of the Rio Bravo, accompanied by a well organized party, with a complete set of instruments, camp equipage, &c. In crossing the Gulf, the sea was happily smooth, and it was not until we neared the coast and encountered the trade winds, which blow there almost ceaselessly from the southeast, that it became very rough. The steamer did not enter the mouth of the Rio Bravo, but steered her course towards the Brazos Santiago, eight miles up the coast. It was a long time before a pilot could be got on board, and then we were informed the sea was running so high on the bar, it was impossible to cross, and we were reduced to the necessity of lying "off and on" until the sea ran down. The captain gave orders to the mate to put the vessel's head to sea and stand out until day-break, under easy steam, and, with the pilot, went to sleep. The mate, a silly young man, addicted to intemperance, had made several remarks which destroyed my confidence in him, and having much at stake in the safety of the vessel, I did not go to bed. It was fortunate I did not, for, while dozing on the upper deck, I was gradually aroused by a roaring, seething sound, and on looking forward, saw that we were going head on to the breakers. There was no time to wake the captain, and I gave the alarm to the man at the wheel, and ran to the engineer to make him put on all steam. For many moments it was doubtful if the vessel could be got round. By great exertion, however, the steam was raised, and she barely escaped what appeared to be inevitable destruction.

The next day the sea continued to run high, and being thoroughly disgusted with my sojourn aboard the steamer, I went ashore in the pilot-boat.

The steamer was stranded a few trips subsequently, in attempting to make the entrance of the Brazos Santiago.

The bar has but eight feet of water, and is very shifting. That at the mouth of the Rio Bravo has still less. Yet it was at these two points that the troops were landed, and all the supplies for the army which invaded Mexico, under the orders of General Taylor. Most of the merchandise intended for the lower Rio Bravo is landed at the Brazos, and thence reshipped in a strong river steamer, which passes out to sea and thence into the Rio Bravo. The channel of the mouth of the Rio Bravo varies a little in depth, but is seldom more than six feet or less than four; it is of soft mud, and of the numberless vessels grounded there during the war, not more than one or two were lost. The bar of Brazos Santiago is of hard sand, and a vessel grounded there is certain to be stranded. The mouths of both these harbors open towards the prevailing wind, and I can suggest no method by which they can be improved at any reasonable cost. The town of Brazos stands on a sand-spit immediately within the bar, and is little more than a collection of wooden shanties, left there by the army, which may be washed away some day by a norther forcing the water from the lagoon, or bay, above, faster than it can escape over the beach and through the narrow inlet into the sea.

Three miles within the lagoon, or bay, and standing upon the first firm ground, a bluff of alluvial soil, about six or ten feet high, is Point Isabel. Here is the custom-house, where the goods intended for the river, as high up as Roma, are entered. Those for the towns above that point are supplied usually by the way of Indianola and San Antonio. Point Isabel is a small settlement, the principal buildings being those erected by the army of occupation in 1846. It was from this point the army made its march to fight the battles of Palo Alto, Resaca de la Palma, Fort Brown, &c.

It is well known that the Mexicans selected their own ground for the two first named battles; but if General Taylor had had in his hand the correct map now presented of that country, as will be seen by a glance, he could not have selected, in the neighborhood, a better field than Palo Alto to fight a small force against a larger one. This fact may have been known to others, but was not developed to my mind until the completion of this map. It will be seen that both flanks of the American army were protected, and the Mexicans were prevented by the ground from using the advantage due a much superior force to extend their flanks and envelope the American forces. The country is almost a dead level, and presents to the view of a horseman one unbounded plain, relieved by clusters of mezquite trees, (chapparal,) and the existence of the morasses to the right and left of the American position was probably not known to the Mexicans until they attempted to outflank their adversaries.

It was not my good fortune to have been present at either of those engagements; but I trust some of those who were will take advantage of the map now furnished, to figure for the military student the position and manœuvres of the troops on both sides, in those battles, so unique in their execution and results. Those two battles gave the prestige to our arms in the Mexican war, and saved the United States Military Academy from destruction.

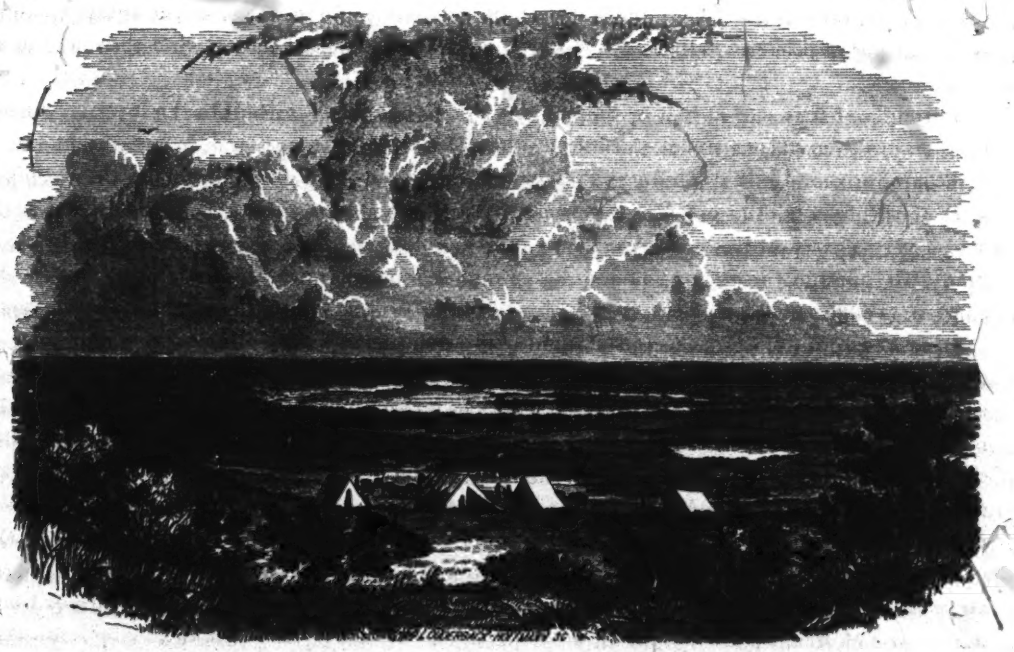
The Mexican army was well organized, well disciplined, and well equipped, inured to war by contests with the Indians, and in suppressing internal revolution. The American army was perfectly disciplined, but, with the exception of its chief, and a few other gallant old officers, had never been under fire, and numbered only one-third of the opposing force. Yet on

their first encounter, the subordinate officers, chiefly from West Point, executed their orders with the precision of a field day exercise, showing beyond all question the utility of military education and discipline, and putting to rest at once the attacks on the Military Academy, which had become so formidable that few believed it possible to sustain the institution a year longer.

The general description of this part of the country will apply equally to all the coast of Texas, from the mouth of the Rio Bravo to the bay of Corpus Christi—indeed to Matagorda bay. It is well known to be a low, flat coast, with soundings diminishing regularly in depth as you approach the shore. The first shore-line is that of an island varying from some hundred yards to several miles in width, and penetrated at various points by inlets with shifting bars, few of which are practicable for the entrance of even the smallest sea-going craft. Separating this from the main land are shallow lagoons, as variable in breadth as the island which separates them from the ocean.

When the army marched from Corpus Christi to Point Isabel, General Taylor attempted to transport his supplies by the lagoon separating the two places, but found it impracticable even with small boats. These lagoons abound in delicious fish and fowl.

Proceeding inward, the land bordering the lagoons is, in the first ten or twenty miles, usually a flat prairie, composed of alluvial soil and sedimentary deposites of the ocean in alternate layers, showing how gradual and well contested have been the encroachments



Laguna below Lomita, fifteen miles above mouth of Rio Bravo del Norte.

of the land upon the sea. The rivers taking their rise in the cretaceous formations, both the sedimentary and alluvial deposites are heavily charged with lime, making the soil rich, black, and fiery—often so surcharged as to destroy some descriptions of vegetation. Within this belt, salt lakes of value are not unfrequently found, and throughout its whole extent spots

occur devoid of vegetation, and encrusted with a white saline deposite. Most generally, however, the vegetation is a luxuriant coarse grass which grows nearly waist-high, with an occasional clump of live oak bordering the wet places. I think it likely this whole belt of country has been formed in the following manner: the trade-winds from the southeast are felt here with considerable force, and, blowing inward for nine-tenths of the time, fill the lagoons with salt water. Suddenly the wind will shift in a contrary direction, and blow with violence for two or three days, called there a norther, forcing the salt water out to sea, and leaving the dry places to be covered by fresh water, thus forming alternate layers of salt and fresh water deposites.

This coast, as well as the whole coast of Texas, is sometimes swept by terrific tornadoes, which produce marked changes in its topographical and hydrographic features. In the latter part of the month of September, 1854, on my passage in the steamship Louisiana from New Orleans to Indianola, we encountered a violent hurricane. A few days afterwards we entered the mouth of Matagorda bay, and found the channel had been improved by the storm. It was deepened two feet, and instead of finding only nine, we found eleven feet of water on the bar, and the channel straightened. This beneficial effect remains, I am told, to this day. This hurricane, which swept the town of Matagorda level with the ground, and destroyed every wharf in the bay of Matagorda, except that upon which our instruments were placed, forced the water out of the bay at such a rapid rate, that it could only escape by deepening and widening the channel.

After passing the belt of prairie, we find a ridge of low sand-hills which seem to have marked the former limits of the coast, and here for the first time going towards the interior, we meet with clumps of post-oak called *mots*. The trees are usually crooked and wind-shaken, and unfit for timber.

Throughout this second belt or steppe, which extends many miles into the interior, wherever sand occurs to give consistency to the limestone soil, we find this growth in great abundance.

This admixture of soil produces the richest cotton and corn-growing soil in the world; but west of the Nueces, and between that river and the Rio Bravo, the want of rain makes agriculture a very uncertain business, and as we approach the last named river, this aridity becomes more marked, and the vegetation assumes a spinose stunted character—indeed, so marked is the change, that when we get within a few miles of the river the vegetation is a complete chapparal.

West and south of the Nueces the country is sometimes exposed to excessive and long continued droughts, and it is doubtful if agriculture can be made profitable without irrigation; all the region between that river and the Rio Bravo is, however, a fine grazing country, and the numbers of horses and cattle that ranged it, belonging to the settlers on the Rio Bravo under the Spanish rule prior to 1825, are incredible. To this day the remnants of this immense stock are running wild on the prairies between the two rivers. Hunting the wild horses and cattle is the regular business of the inhabitants of Loredo and other towns along the river, and the practice adds much to the difficulty of maintaining a proper police on the frontier to guard against the depredations of Indians and the organization of fillibustering parties. In times of agitation and civil war on the Mexican side, parties assemble on the American side ostensibly to hunt, but in reality to take part on one side or the other in the affairs of our neighbors. I had heard a great deal of these wild horses, but on an examination of many hundred that had been caught, I never saw one good one. They are usually heavy in the forehand, cat-hammed, and knock-kneed. Their habits are very peculiar; they move in squads, single file, and seem to obey implicitly the direction of the leader. They evince much curiosity, always reconnoitring

the camp of the traveller at full speed, and when there chances to be a loose animal, be he ever so poor and jaded, he is sure to run off with the crowd and disappear entirely. Many a luckless horseman passing through this country has been left on foot by the "stampede" caused by the visits of these wild animals.

Passing through that region in 1852, after a long journey of several thousand miles, my animals so jaded and worn down that I considered nothing could stimulate them to a gallop, my line was charged by one hundred and fifty of these animals, and six mules with a heavy wagon, containing all the astronomical and other instruments of the boundary commission, followed them across the prairie at full speed for nearly two miles. The coolness of the driver, and the boldness of the wagon-master, who threw himself in front of the lead-mules, stopped their further progress.

The section of country, particularly that part under consideration, is traversed by deep gullies called arroyos, sometimes difficult to pass in wagons. The sketch here presented shows one of these arroyos crossed by the road leading to Loredo.

Arroyo Secate, two miles below Loredo.

These arroyos are natural consequences of the unequal manner in which the rain falls throughout the year. Sometimes not a drop falls for several months; again, it pours down in a perfect deluge, washing deep beds in the unresisting soil, leaving behind the appearance of the deserted bed of a great river.

The streams which are found in this country have their rise in limestone regions, and the water is very unwholesome even when the stream is flowing, but usually the beds of the streams are partly dry, and the water is found standing in holes. Superadded to its noxious mineral ingredients, it holds in solution offensive vegetable matter, and is disgusting to drink; yet it is

upon this water that our soldiers are kept nine-tenths of the time while watching and pursuing the Indians who are constantly making incursions from the Mexican side into the settlements of Texas. While the country was in the military occupancy of the Spaniards previous to the revolution of 1825, they provided against this inconvenience by making at certain stations great reservoirs of solid masonry to catch the rain-water. The remains of many of these wells were found, and they form one of the many external objects to be seen throughout the extent of the frontier which convey the impression that the country has steadily gone backwards since the days of the Spanish rule.

Having now given the general view of the country on the American side of the first section of the boundary, I will ask the reader to ascend with me the Rio Bravo along the boundary, where I will describe in detail all that is worth noting as high as the mouth of the Rio San Pedro, or Devil's river, from which point we will take a general view of the country on the Mexican side, comprising the States of Coahuila, Tamaulipas, and New Leon.

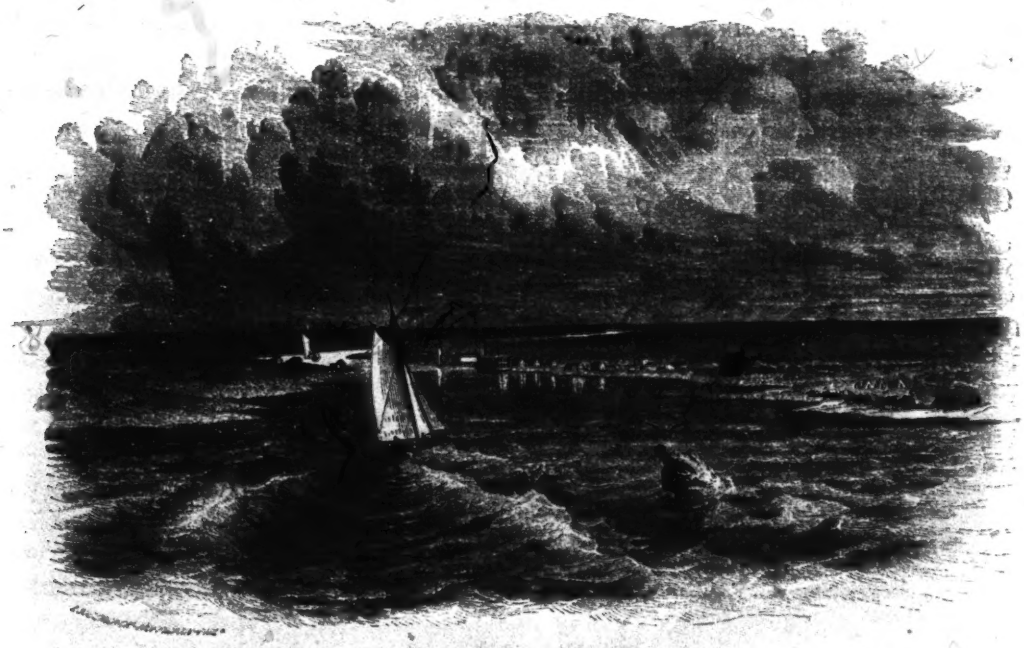
Before ascending the Rio Bravo, it may be as well to state that the appointments for the survey of the river consisted mostly of light boats unsuited to hydrographic work in the open Gulf; and not wishing to incur the expense of an outfit for the limited surveys required by the treaty, outside the river, I proposed, with the concurrence of the Secretary of the Interior, to obtain the co-operation of the Superintendent of the Coast Survey, who had several well equipped parties in the Gulf, and whose operations I knew would eventually be extended to that locality. Under this arrangement, by which the boundary commission paid the expenses incidental to changes in its original plan of operations, and by which it was agreed that the hydrography should be done by the Coast Survey, and the astronomy and topography by the boundary commission, Lieut. Wilkinson, in command of the brig Morris, repaired at the appointed time to the mouth of the river and made soundings, marked on sheet No. 1, by which we were enabled to trace the boundary, as the treaty required, "three leagues out to sea."

This survey was conducted in the summer of 1853, that in which the yellow fever scourged the whole Gulf coast; yet up to the time of leaving the station, late in the summer, no case of the disease had occurred on board the vessel, and but a single one among the land parties. In conformity with a promise made, I took passage in the "Morris," which was not entirely sea-worthy, and went with the party to Pensacola, where the yellow fever was raging, and we had to lament the loss of the surgeon, Dr. Bryan, whose high professional skill and many social virtues endeared him to all who were honored with his friendship. Several others of the party, myself among the number, were taken down and narrowly escaped the fate of Dr. Bryan.

The voyage across the Gulf, which should have occupied five days, was, owing to adverse winds, gales, and the condition of the ship, extended to eighteen days. I had an opportunity on this voyage to watch narrowly the effect of the storms on the barometer, and observed for the first time a fact which, I believe, has since been well established, that in the Gulf the fluctuations of the barometer fail to give the usual indications of the approach or subsidence of storms.

The entrance to the mouth of the Rio Bravo is over a bar of soft mud, varying from four to six feet deep, and the river within a few hundred yards of its mouth is not more than one thousand feet wide. The shore-line of the coast, scarcely broken by the action of the river, is formed of a series of low shifting sand-hills, with a scanty herbage. Inside these hills are numerous salt marshes and lagoons, separated by low belts of calcareous clay but a few feet above the level of the sea, and subject to overflow. The first high ground is Burrita,

ten miles from the mouth, where there is a small settlement of Mexicans engaged in agriculture upon a very limited scale.



Mouth of the Rio Bravo del Norte.

At the mouth of the river there are a few frame houses erected by the army in 1846, now owned by the steamboat company engaged in the navigation of the river. Opposite is a small Mexican settlement called Bagdad, where the Mexicans from the interior, as far as Monterey, resort for sea bathing. The sites on either side of the river are very unsafe. A few years before the Mexican war, the whole population was swept off except the pilot, an American, who, with his family, took refuge on the top of the sand-hill upon which my observatory was afterwards erected.

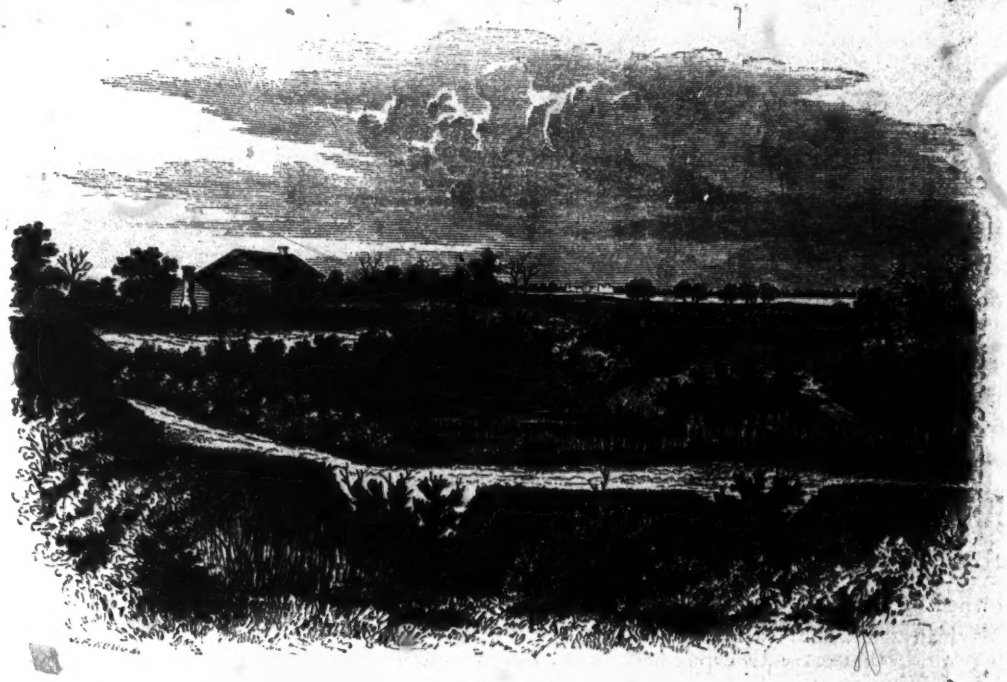
Beyond Burrita, the river still pursues its serpentine course through alluvial soil, with an occasional patch of arable ground occupied by Mexican rancheros engaged in the cultivation of maize and the rearing of goats and chickens.

At the Rancheria de San Martin, a mouth of the Rio Bravo, forty feet wide, opens on the American side into the Laguna Madre, allowing some of the water of the river to escape to the sea by the Boca Chica and the Brazos St. Iago. On the American side the road leading from the mouth of the river to Brownsville crosses this outlet at San Martin, over a substantial wooden bridge erected by the army.

From this point upward to Brownsville the river makes a great bend to the South, and is so winding in its course that frequently the curves almost touch. The land on each side is level, and covered with a dense growth of heavy mezquite, (Algaroba.) It is generally too high for irrigation, and the climate is too arid to depend with certainty upon rain for the purposes of agriculture. The vegetation is of a semi-tropical character, and the margin of the river, which is exposed to overflow, abounds in reed, canebrake, palmetto, willow, and water-plants, and would no doubt produce the sugar-cane in great luxuriance.

Brownsville, situated on the American side of the river fifty miles from its mouth by the course of the river, is only twenty-two miles distant by the road. It contains about three thousand inhabitants. The houses are mostly of wood and well built. The town has sprung up since the Mexican war, and owes its prosperity chiefly to the contraband trade with Mexico.

Opposite Brownsville is the ancient town of Matamoras, with a population about the same in number as Brownsville.



Old Fort Brown, Texas.

Below Brownsville, and adjoining it, is the military post, with old Fort Brown at the farthest extremity of the public grounds. In the middle of the parade ground, unmarked by any monument, lie the remains of the gallant officer who fell in defence of the fort which now bears his name. The height of Fort Brown above the sea is, by barometrical measurement, fifty feet. The mean temperature for the years beginning 1850, and ending 1855, was 73° Fahrenheit; the mean quantity of rain in the same years was annually 33.65 inches. These quantities are taken from the Army Meteorological Register, and are used in preference to my own, as they cover a much longer space of time. They would seem to indicate an abundance of rain for all the purposes of agriculture, and we should be at a loss to understand the arid character of the country on both sides of the river, were it not that the tables give us the solution; we there find that more than one-half the rain falls in the autumn, which is followed by a winter during which the thermometer frequently falls below the freezing-point. One-fourth the whole quantity of rain falls in a single month, and it very often happens that no rain whatever falls in the months of May, June, and July. Consequently, throughout the whole valley of the Rio Bravo and its tributaries, we seldom see corn growing except in the bottoms, subject to over-

BROWNSVILLE, TEXAS

flow, or upon lands which are below the water-level and can be irrigated by artificial channels. Somewhat of this barrenness is due undoubtedly to the excess of lime and saline matter with which the soil is charged.

As we ascend above Brownsville, lands within the water-level become more frequent and extended, and at many places cultivated fields form a prominent feature in the landscape. Up as high as Reynosa, the belt of alluvial soil subject to the influence of the moisture from the river is very considerable in width, and in addition to corn, the sugar-cane has been planted with success. The foliage on this portion of the river indicates a richer soil, and the trees assume very much the dimensions of those on the alluvial bottoms of the Mississippi.

It is within this region, embracing a river coast of one hundred miles, that the sugar-cane can be cultivated to advantage; and in situations sheltered from the northers, I have no doubt oranges and lemons could be raised with facility.

Property, however, is very insecure all along the boundary, and unless extradition laws with Mexico are passed, this fertile tract will never have its capacities developed.

The boundary between the United States and Mexico is here only an imaginary line running down the centre of the river, and an offence can be committed on either side with impunity. A few minutes served to place the offender over the line, when the jealousies of the law on either side step in to protect him; and where national prejudices are involved, the criminal is not unfrequently extolled for his exploits.

It was in the summer of 1853 that this portion of the boundary was surveyed, and a revolution headed by Caravajal was in its last throes. This chief had retired to the American side of the river, and was occupied in making occasional forays into Mexico, aided by some American volunteers, mostly composed of young men, whose tastes for civil pursuits had been destroyed by the Mexican war. These efforts were attended with no other effect than that of irritating the peaceable inhabitants on both sides, and were of great inconvenience to us in the prosecution of the survey. Attempts were made several times to stop the parties under my command engaged in the survey of the river, and on one occasion nothing but the forbearance of the officer in command prevented his party from firing upon a detachment of Mexican cavalry which threatened to charge them. In the absence of the Mexican commissioner, I was at length compelled to make a direct appeal to General Cruz, then in command on the Mexican side, who promptly gave orders along the line which had the effect to lessen, in some degree, the interruptions to which the surveying parties were exposed.

We were scarcely more in favor on the American side of the line; for some months previously the United States troops had interfered with a strong hand to break up the enlistment of men and the concentration of fillibustering forces on our side of the river. Although most of the hired men employed by me were disbanded fillibusteros, the parties escorted by a detachment of United States soldiers, were usually mistaken for military scouts in search of the violators of the law, who at that time composed the majority of persons on the frontier.

Some idea of the reckless character of the persons then infesting that frontier may be formed from the following circumstance, the truth of which is vouched for by several respectable eye-witnesses. My own camp was but a short distance from the place where the scene occurred:

One mild summer's evening several gentlemen, among them a retired officer of the fillibusteros, were enjoying the delicious twilight of that climate on the bank of the river opposite a point where was usually posted a picket-guard, detached from a Mexican military station four miles distant. The guard of ten men were seen to approach the jacal, dismount, tie their

horses, and stretch themselves on their blankets, some to sleep, others to smoke, but none particularly to watch.

The conversation of the first-named party was rather of a jocose character, directed at the expense of the young American fillibuster who had joined in the Caravajal revolution, which had just been ended with such signal advantage to the regular Mexican troops. A little nettled, probably, at what had passed, he offered a wager of one hundred dollars that he would cross in a boat and take the guard, single-handed. His wager not being accepted, he offered to bet "drinks for the party." Some person, not dreaming he was in earnest, indiscreetly took the bet.

The absence of the fillibuster was scarcely noticed, and the conversation about other subjects had continued for nearly an hour, when it was interrupted by the sharp reports of a revolver, and a yell which reverberated from shore to shore, giving the impression of many voices; these were quickly followed by the rolling fire of a platoon of musketry, and then all was silent. "Could that be S——?" asked one. "Impossible!" was the reply. "It would be just like him," said a third. Shortly after a boat containing two or three men was seen to dart across the rapid current from the shadow of the high bluff on the American side. As it approached the opposite side, its occupants, not wishing to violate the usages of the guard, called out in Spanish they were friends, going over to see what was the matter. "*Matter? Hell!*" answered a voice in English, "Come here and help me to drive these mustangs in the river." They found the guard dispersed, and S—— with one arm shattered by a musket-ball; with the other he was trying to lead all the ten horses to the river-shore.

Reynosa is a small Mexican town of about 1,500 inhabitants, opposite an American settlement called Edinburgh, with one or two substantial warehouses. The last-named town, like all the others on the American side, except Loredo, has been built since the war, and owes its existence chiefly to the contraband trade with Mexico. Reynosa is built on a low cretaceous ridge, and it is here the first rocks above the surface are seen; yet none appear on the immediate banks of the river until we reach Las Cuevas, some distance above, where we find a stratum of cretaceous sandstone 10 or 15 feet thick. At the last named point, and thence up the river, there is also a marked diminution in the quantity of bottom-land susceptible of cultivation, and vegetation changes its character, becoming more dwarfed and spinose. The uplands on either side impinge close upon the river, and the vegetation is principally mezquite and cactus. On the Texas side, as we recede from the river, the chapparal gives place to the open prairie, covered with luxuriant grass. This character of the river lands extends with little variation up to Ringgold Barracks.

This military post consists of a few comfortless frame houses, situated half a mile below Rio Grande city. Opposite, and four miles from the Rio Bravo, is the town of Camargo, of about one hundred inhabitants. It is situated on the San Juan river, the first unfailing tributary to the Rio Bravo from the Mexican side. It is one of a series of rivers which rise in the so-called Sierra Madre, and go to supply the Rio Bravo in summer, the season of tropical rains, when that river most requires replenishing, as then the supply of water from the melting of the snows at its northern sources is nearly exhausted.

Ringgold Barracks was one of the points selected for the close determination of latitude and longitude to check the lineal surveys, and a point from which excursions could be made with facility, to determine secondary points by reflecting instruments and by the transmission of chronometers.

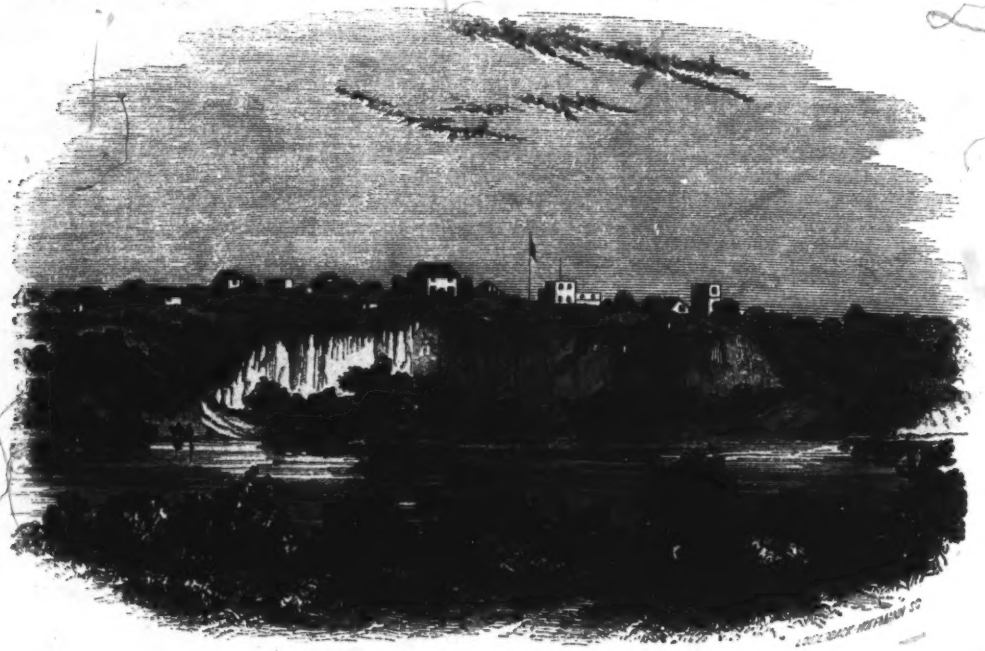
The result of the astronomical observations, and some of the observations themselves, will be found in the Astronomical Appendix.

Ringgold Barracks and Rio Grande City.

Through the courtesy of Major Paul, the commanding officer at Ringgold Barracks, the observatory was placed within the enclosure of the military grounds, and west of the officers' quarters. The height of this point above the sea, by the barometer, is 521 feet; the magnetic dip 52° 27′, and the declination 9° 15′ east. The observatory was 70 feet above the bed of the river, so that the river-bed is 451 feet above the sea at this point. The distance to the sea, measured by the sinuosities of the river, is 241 miles; the direct measurement only 75 miles. If the river had a direct run to the level of the sea, it would have a fall of six feet to the mile, and would probably empty itself in dry seasons, so that the tortuous course of the river, so vexatious to the traveller, is of importance in an economical point of view. My observations embraced three summer months at Ringgold Barracks, during which time the excessive heat was tempered by the sea-breeze, which was felt here daily with great force. Dr. Brown, assistant surgeon United States army, stationed at this post, has kindly furnished me with the meteorological journal kept by him for several years, and I give it in place of my own, as it extends over a much greater space of time, and will, therefore, afford a much more comprehensive view of the climate. It may, also, be taken as a fair type of the climate of that region of country which extends from Brownsville to Eagle Pass. It will be seen from this and subsequent records how dry the country becomes as we go towards the centre of the continent.

The beautiful town of Roma, 16½ miles above Ringgold Barracks, is the present head of steamboat navigation; it is built upon a high bluff of yellowish sandstone, containing ferruginous nodules. When I visited this small town, I was at a loss to know how such fine residences and warehouses, all recently built, could be sustained by its trade; but being the guest of the owner of one of these large establishments, I did not think proper to be very inquisitive. At night, when I went out to take my observations for the determination of the latitude and longitude of

the place, I found that the mercury of the artificial horizon was very tremulous, notwithstanding the calmness of the night. Not being able to overcome the difficulty, or ascertain its cause, I



Roma, Texas.

put up my instruments and returned to my quarters. On the way I encountered a long train of mules, heavily laden, directed towards the Mexican side of the river. The motion of the animals caused the disturbance of the mercury, and their rich burden of contraband goods, intended for the Mexican market, explained the commercial prosperity of the town. As might reasonably be expected in any country where the duties on foreign goods amount almost to prohibition, smuggling ceases to be a crime, but is identified with the best part of the population, and connects itself with the romance and legends of the frontier.

Between Roma and Ringgold Barracks there is much excellent land susceptible of irrigation, and both banks of the river are thickly settled with Mexicans. There are many Americans in this part of the country engaged in trade, but I cannot, at this moment, recall to mind a single one engaged in agricultural pursuits. Sugar cane will grow on this part of the river, but the land is rather too elevated for that plant to be grown with profit. Indian corn is the staple product, and when extradition laws are enacted and enforced, and the Indians who periodically plunder the country are exterminated, the rearing of cattle will be followed with advantage.

After studying the character and habits of that class of Indians called wild Indians, and bearing in mind the mild and humane government extended over them by the missionaries of the Church of Rome, without producing any results, I have come to the deliberate conclusion that civilization must consent to halt when in view of the Indian camp, or the wild Indians must be exterminated. Nothing could exceed the judgment, perseverance, and humanity with which the various orders of the Catholic Church have pursued, for three hundred years, the work of redemption among these savages; but at the very moment when Christianity appeared most likely to triumph, the savages turned upon their benefactors and swept them from the face of the

earth. There are distinct races among the Indians as among the white men, and before the advent of Christianity they were divided into semi-civilized and wild races. The semi-civilized then, as now, cultivated the soil, lived in houses, some three stories high, and kept faith with each other, and it is among these that Christianity has made any permanent impression. The wild Indians were then, as they are now, at perpetual war with them, leading a nomadic life, defying all restraint, and faithless in the performance of their promises. They have but two settled principles of action—to kill the defenceless and avoid collision with a superior or equal force. In the early stages of my experience with these Indians, I was inclined to believe them maltreated, and to consider their present reckless condition the result of the encroachments of the white people upon their rights; but such is not the case—experience proved to me that no amount of forbearance or kindness could eradicate or essentially modify the predominant savage element of character. The semi-civilized Indians form, however, much the larger class of Indians on the Mexican frontier. Indeed, nine-tenths of the population of all Mexico are Indians, or have the blood of Indians coursing in their veins. A pure white, of unadulterated Spanish blood, is rather the exception than the rule. I do not know how far the effects of the sun can be considered to have bronzed the complexion, but it seemed to me the proportion of pure white in the northern States of Mexico bordering on the boundary, was greater than in southern Mexico, always excepting the cities of Jalapa, Puebla, and Mexico.

One of the most important duties of our survey was to determine to which side the islands in the Rio Bravo belonged. For this purpose it was agreed between the Mexican commissioner and myself to sound the river on each side of every island, and the centre of the deepest channel should be the boundary line. From the mouth of the river to Ringgold Barracks there are eleven islands, marked on the map from 1 to 11, commencing at the mouth, and this order of numbering the islands is observed until we reach the parallel of 31° 47′, where the boundary leaves the river. The sheets of the boundary, on a scale of $\frac{1}{60000}$, are numbered from 1 to 54, No. 1 being the mouth of the Rio Grande, and the numbers progressing regularly from the Gulf of Mexico to the Pacific. The islands are numbered on these sheets to indicate their geographical position, but they are represented also on separate sheets on a scale of $\frac{1}{6000}$, to show their topographical and hydrographic details, and to exhibit upon what data they have been allotted to the United States or to Mexico.

Up to Ringgold Barracks these islands are of little value, but above that they are of more importance. Islands Nos. 12 and 13, between Ringgold Barracks and Roma, both fall to the United States. No. 13, called on the maps Beaver island, divides the waters of the river into three parts, and the channel which lies nearest to the Mexican shore is so narrow that steamers can with difficulty pass through it, yet the branches are, by reason of their shallowness, wholly impassable for them. An attempt was made by the Mexican local authorities to arrest the steamboat in its passage through this channel, but not only the survey, but the actual experience of the navigator, proved the narrow one to be the true channel, and consequently the boundary between the two countries. The allotment of all the islands was made upon the condition of things as they existed when the boundary was agreed upon. The channel of the river may change and throw an island once on the Mexican side to the American, and vice versa, but neither the Mexican commissioner nor myself could provide against such a contingency, none having been anticipated in the treaty.

We however agreed, as far as that agreement may be worth anything, that in case the channel

of the river changed, the right of navigation through the new channel should remain unimpaired to both countries, but the jurisdiction of the land must remain as we had arranged.

Five miles above Roma, and opposite Mier, there is a large island called Los Adjuntas, which was awarded to the Mexican side. At present the channel is between the island and the American shore. Formerly the channel was very nearly equally divided on either side of the island, but during the occupation of Mier by the American troops a temporary causeway was constructed of loose stone, to enable the cavalry to cross their horses to the island for the purpose of grazing. This causeway, now nearly washed away, has given a permanent direction to the channel which rules the island out of our territory. At the lower end of the Los Adjuntas and on the Mexican side are tepid baths, luxurious for the robust, and valuable for a certain class of diseases. The springs which supply these natural baths are near them, and are supposed to possess medicinal virtues of a high order. They were supposed to be sulphur springs, but analyses of the water which I placed in the hands of Dr. Easter detected no trace of sulphuretted hydrogen.* The zoological character of the rocks from Reynosa, where the cretaceous formation was first noticed, up to Las Moras, a distance measured on the parallel of latitude of 144 miles, is much the same, while they differ in their lithological character. If any difference is to be noted in the zoological character of these rocks it is in the exposure, just above Roma, at the foot of the island of Las Adjuntas, and at several other localities in the neighborhood, of banks of fossil oyster-shells of great size, some of them measuring 18 inches in length.

I have noted at Roma the occurrence of sandstone studded with nodules of ferruginous iron. Throughout the section between the San Juan river and Loredo, septaria and strata of yellowish and green sandstone frequently occur. Often the nodules of more durable substance project beyond the weather-worn surface of the softer sandstone, producing picturesque appearances.

The town of Mier, famed in the history of the war of independence of Texas, stands upon the Alamo river, four miles back from the Rio Grande, contains about 700 inhabitants, and is now chiefly noted for the superior quality of the blanket manufactured there. It was an important point during the war with Mexico, being the point where the road to Monterey diverges from the Rio Bravo, and where the supplies for the invading army were transferred from water to land transportation. From Mier upwards, the course of the river is more nearly north and south, and less winding in its course. The banks on either side become more abrupt and rocky, and for the first time in ascending we find a rocky bottom.

Forty-six miles above Roma, measured by the river, is Bellville, the trading establishment of a hospitable and enterprising gentleman who has built himself a warehouse something after the fashion of old feudal castles—not for the purpose of ornament, but for defence against the Indians

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*The following is the result of the quantitative analyses by John D. Easter. The whole quantity of solid matter was 0.6763 per cent., consisting of—

Silica	0.016586 per cent.
Botoreide iron	0.000754 "
Alumina	traces.
Lime	0.009389 "
Magnesia	0.009580 "
Sodium	0.243323 "
Chlorine	0.340470 "
Sulphuric acid	0.010180 "
Phosphoric acid	traces.
Iodine acid	traces.
	0.630282

FALLS OF THE RIO SALADO.

and banditti of that country. Opposite, on the banks of the Salado, and four miles from the Rio Bravo, is the town of Guerrero. The Salado, like the San Juan, and the Alamo which comes in at Mier, is a clear stream, having its rise in the sierras of igneous and metamorphic rock to the west, and forms a true oasis in the wilderness of rotten limestone which is found on either side of the lower Rio Bravo, and which causes the waters of most of its tributaries to be brackish and unwholesome.

The falls of the Salado are seven miles above its junction with the Rio Bravo. A floral phenomenon exhibits itself on the Rio Bravo, which finds its explanation at these falls. Just above Roma, and thence to the mouth of the Salado, the cypress is found growing in the bed of the Rio Bravo, and it was a matter of conjecture why it should grow there and not elsewhere. On ascending the Salado to the falls, it was ascertained the principal growth on that river was cypress, and the trees in the Rio Bravo were evidently emigrants from this colony. It is to be hoped that this useful tree will continue its emigration downwards, where the country is now destitute of all building wood.

The land from Bellville to Loredo is not altogether barren; there are many flats on which the water of the river could be brought for the purposes of irrigation; but, until recently, the Indians have had entire possession of the country, and now they make continual forays, crossing and recrossing the river to elude pursuit, at some of the many fords which occur in the river. I was myself very near falling into the hands of a party of these savages. Passing in a wagon from Bellville to Ringgold Barracks, in one of our excursions to determine the astronomical position of the former place, accompanied only by assistant Clark and the driver of the instrument wagon, we struck the trail of a band of Indians, where two roads united, so close that the dust was still flying. We supposed at the time we were following on the heels of a gang of wild mustangs going to water. These Indians were pursued by Captain Granger of the rifles, and brought to bay just as they were crossing the river and making good their escape to Mexico. That energetic officer succeeded in killing the chief and several others, and capturing all their horses and arms.

In many instances, along this portion of the river, American capital has associated with it Mexican labor, in the attempt to open farms for the produce of grain and the rearing stock, but the incursions of the wild Indians, and the depredations of the semi-civilized and half-breed Indians, render such enterprises uncertain and unprofitable. After we ascend about thirty miles above Loredo, all settlements on the Texas side cease until we get in the immediate neighborhood of Eagle Pass.

At Loredo there is a very considerable Mexican settlement, which dates back to the times when the Spaniards occupied the country. It has at present fallen into decay, and derives its support principally from the United States garrison, (Fort McIntosh,) one mile above the town. Loredo was once the residence of proprietors of countless horses and cattle, which have been run off by the Indians. Some of them, escaping from their captors, have formed the source of the numerous herds of wild horses and cattle that are now roaming the prairies to the east and north, the pursuit of which affords the chief occupation of many of the inhabitants of the Rio Bravo.

The country around Loredo is much the same as that described about Ringgold Barracks, but is more elevated and more frequently intersected by dry arroyos, which give evidence of more frequent and copious falls of rain.

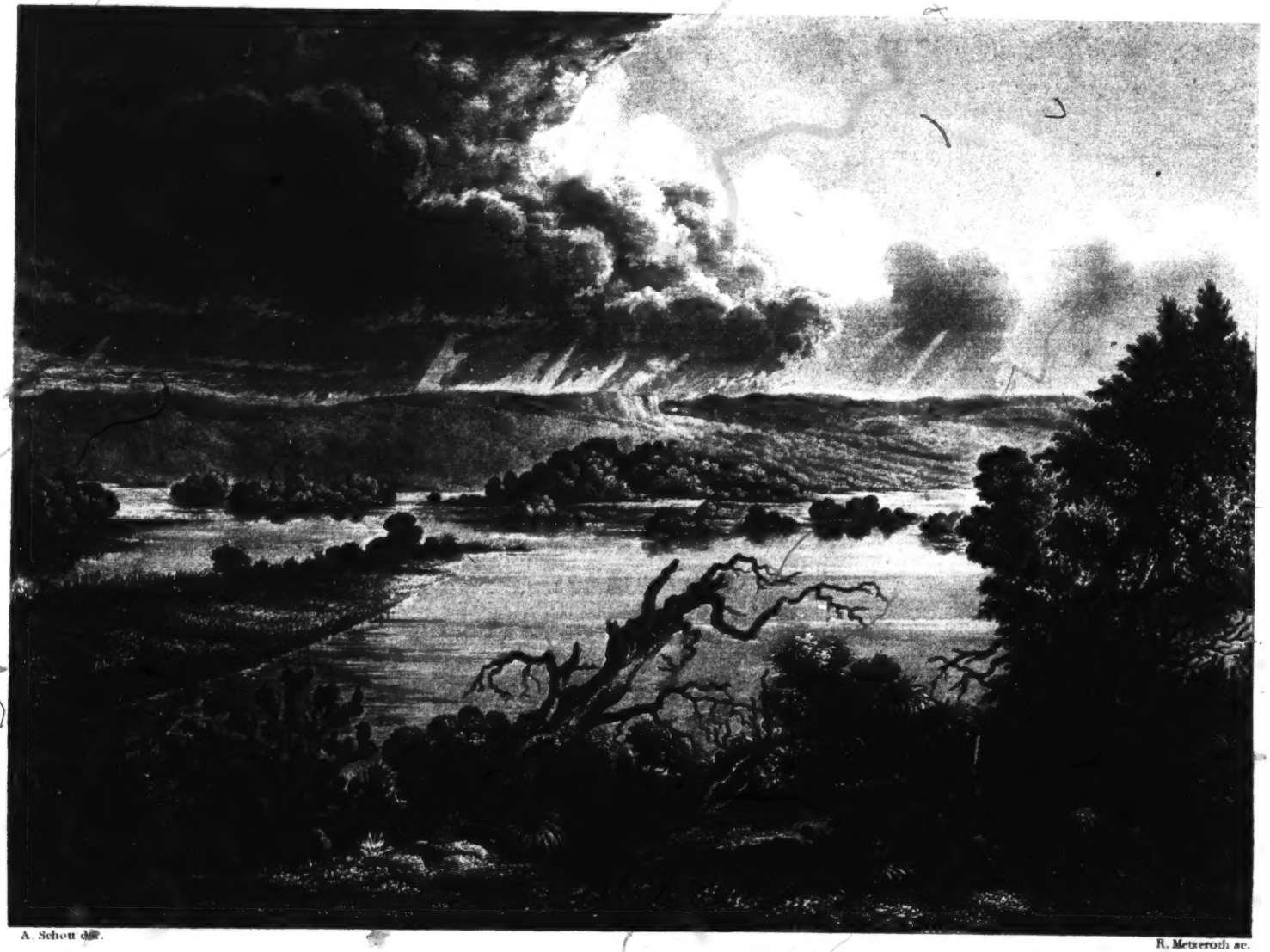
Here, too, the geological character of the country is a little changed by the frequent occur-

rence of strata of compact blue limestone, useful in building. The public buildings at Fort Duncan (Eagle Pass) are of this material. Other strata also alternate with the main stratum of cretaceous sandstone, composed of blue clay, more or less hard, and masses of [illegible] and oyster breccia of solid consistence. In the neighborhood of the arroyo [illegible], ten or fifteen miles above Loredo, three miles below Eagle Pass, and also at Eagle Pass, strata of lignite coal occur three or four feet thick. This coal is of great prospective value, considering the scarcity of wood in this country, and the probable demand for fuel when the rich silver mines of the mountains to the south are in full operation.

Between Loredo and Eagle Pass, or Fort Duncan, a distance of 120 miles, measured by the sinuosities of the river, the river, its banks and adjacent country, retain [illegible] the same character; the obstructions in the bed of the river become more rocky, and the falls more precipitous. At one place, called the falls of Rio Grande, or the Islitas, the rapids are impassable, even in small boats, except in the summer months, when the river is swollen by the tropical rains which fall on the mountains to the south and west. These falls, or more properly rapids, are forty miles below Eagle Pass; just above, the old Mexican trail crosses by which the army under General Wöll invaded Texas in the war of Independence, and is the same by which the column of United States troops under General Wool invaded Mexico, to effect a junction with General Taylor, in the war of 1846.

Fort Duncan, five hundred miles from the Gulf, measured by the sinuosities of the river, is only 208 miles measured in a direct line. It is the westernmost of the military posts placed at intervals along the lower Rio Bravo. The town of Eagle Pass adjoins the fort, and is a place of some trade, having a few large warehouses, built of the blue stone obtained in the neighborhood. Opposite is the military colony of the Mexicans, called Piedras Negras (black rocks,) after the coal layers which crop out here. The view of this military colony here presented is not strictly true. The artist has taken the liberty of placing on the houses roofs of carpentry work. The houses are, in truth, only jacals; that is to say, poles placed vertically, with the interstices stopped with mud, and the tops covered in by thatched roofs. The garrison on the Mexican side, below this place, is composed of regular troops. This military colony is an establishment peculiar to Mexico, and similar establishments are to be found at several points higher up the river. The idea attempted to be carried out is to combine colonization and military defence. Each soldier is allowed a certain quantity of land, and is permitted to live with his wife and children, and not required to live in barracks. A certain quantity of land is cultivated for the benefit of the whole colony; beyond the labor required for this, and military service of rather irregular character, the time of each soldier is his own, and he is permitted to cultivate as much land as he pleases.

Under the Spanish rule, prior to 1825, this system was combined with the missionary power of the Catholic Church; and all those Indians now running wild from the Gulf of Mexico to the Gulf of California were brought under the benign influence of the cross, and about the beginning of the present century had attained a state of [illegible] which may truly be called the golden age of this, now, vast deserted country. Under the Spanish dominion, a cordon of military and ecclesiastical stations extended from sea to sea, over a distance of fifteen hundred miles. Military patrols passed regularly from station to station, and at each station great structures were erected for the accommodation of troops, for religious worship, and for the storing of provisions, the remains of which are still to be seen. Among these some of the most beautiful specimens of architecture on the American continent are still to be seen. The



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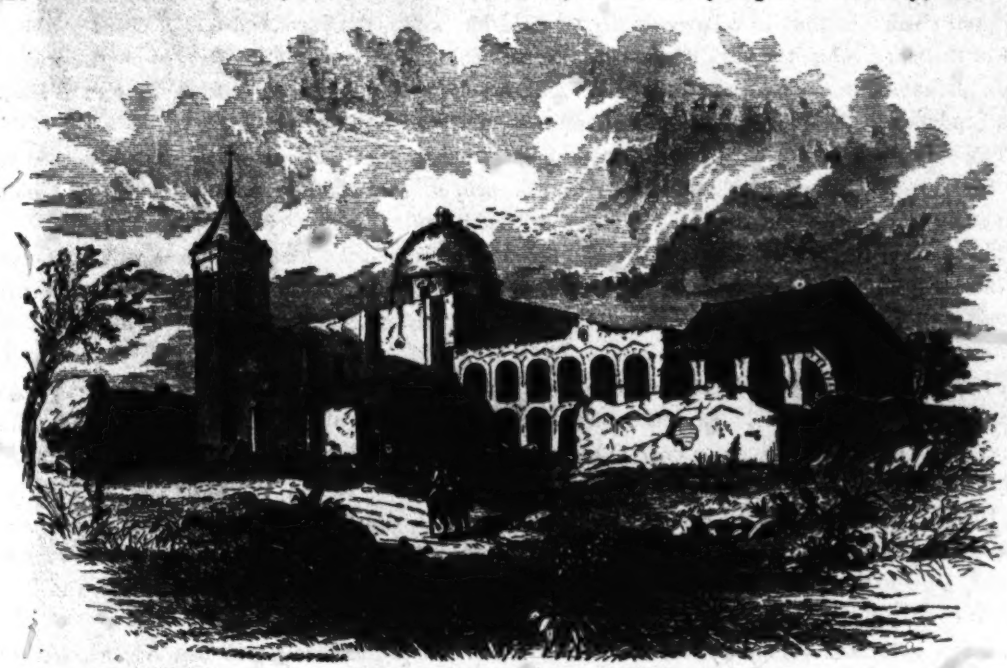
LAS ISLETAS – FALLS OF PRESIDIO DE RIO GRANDE.

two in most perfect state of preservation are the Mission of San José, a church on the San Antonio river, a few miles below the town of that name, a sketch of which is here given, and the Mission of San Xavier, on the Santa Cruz river, in the newly acquired territory, the view



Mission of San José, near San Antonio, Texas.

of which, I regret to say, has been lost. Most of the buildings at these stations, however, were erected of perishable materials, adobe walls, and thatched roofs. As soon as the thatches were destroyed, the walls were washed down nearly to their bases by the rains. The Indians were required to cultivate the soil, and their families were domiciled in the immediate vicinity of the station. The most active and intelligent warriors were incorporated into the ranks of the military.

The downfall of this magnificent cordon of military and ecclesiastical establishments, and the return of the Indians to a savage life tenfold more ferocious than ever, is directly traceable to two causes. First, the revolution, where both the Monarchists and Republicans courted the co-operation of the Indians, and thus invited them to insubordination. Second, and more prominently, the attempts at amalgamation, by intermarriage of the whites and Indians.

This last cause, which is now operating so banefully over the whole of Spanish America, I do not think has been sufficiently estimated, in the attempts to account for the decline and retrograde march of the population of that entire region.

Wherever practical amalgamation of races of different color is carried to any extent, it is from the absence of the women of the cleaner colored race. The white makes his alliance with his darker partner for no other purpose than to satisfy a law of nature, or to acquire property, and when that is accomplished all affection ceases. Faithless to his vows, he passes from object to object with no other impulse than the gratification arising from novelty, ending at last in emasculation and disease, leaving no progeny at all; or if any, a very inferior and syphilitic race. Such are the favors extended to the white man by the lower and darker colored races,

that this must always be the course of events, and the process of absorption can never work any beneficial change. One of the inevitable results of intermarriage between races of different color is infidelity. The offspring have a constant tendency to go back to one or the other of the original stock; so that in a large family of children, where the parents are of a mixed race but yet of the same color, the children will be of every color, from dusky cinnamon to chalky white. This phenomenon, so easily explained without involving the fidelity of either party, nevertheless produces suspicion, followed by unhappiness, and ending in open adultery.

The only mode by which a country can be benefited by the introduction of the white race is by the introduction of both sexes, which, with proper guards upon morals, results in exterminating or crushing out the inferior races, or placing them in slavery.

Throughout Mexico, wherever the white race has preserved its integrity, there will be found a race of people very superior in both mental and physical ability; a condition due to the excellence of the climate, which combines all the qualities requisite for the development of the human being in the highest degree.

From Eagle Pass upwards there are no settlements on the American side, and but a single one on the Mexican side. In places are found the remains of settlements from which the inhabitants have been driven or carried off by the savages. This district of country, extending along the river seventy miles, until within five or ten miles of the mouth of the San Pedro, or Devil's river, is nevertheless the most fertile and desirable portion of the whole Rio Bravo for settlement. On the Texas side it is watered by the beautiful, limpid streams of Las Moras, Piedras Pintas, Zocaté, and San Felipe, which come into the Rio Bravo at right angles, and at equal intervals.

A very extensive region of land is here within the water-level, and can be successfully irrigated; and if we may judge from the products of the settlement at Santa Rosa, in nearly the same parallel, all the sub-tropical fruits and cereals can be raised in these bottom lands to advantage; while the uplands are clothed with a luxuriant growth of the most nutritious grasses. This country is unsurpassed in salubrity, and when the Indians are exterminated, and the adjacent mines shall receive their full development, it will be the paradise of Western Texas. Two causes will operate to postpone this to a very distant day: the proximity to the boundary, which affords so many facilities for the operations of banditti and horse-thieves; and the character of the country beyond, which will be seen, as you ascend the river, to be incapable of continuous settlement, and which must for a long time remain the hiding-place of the wild Indians.

One source of wealth in these table lands, and which is common to all the table lands contiguous to the Rio Bravo as far down as Reynosa, I have not yet pointed out; that is, the extensive growth of certain indigenous plants, the virtues and properties of which are well known to the Mexican and Indian population, and will be found elaborated and specifically noticed in the botanical memoirs appended.

On the mesas, or table lands, which are unsuited to the purposes of cultivation, many plants are found growing useful in medicine and dyeing; and various yuccas, dasylirions, and agaves, genera well known for their useful fibres, which we now import from foreign countries. There are also extensive growths of shrubs and trees of the leguminous order, furnishing gums, tannin, and nutritious pods, highly relished by the herbiferous animals, wild and domestic.

I have before stated that the present head of steam navigation is Roma. At some distant day, no doubt, the navigation will be extended up as high as the mouth of Devil's river,

a distance, measured by the sinuosities of the river, of 567 miles; and with this in view, the assistants in charge of the lineal surveys have been directed to make special notes of the obstructions in the river. The large maps designating the boundary, and deposited in the Department of the Interior, will form the basis upon which estimates for this purpose can be made, but they are too voluminous to accompany this printed report. The ideas now suggested are from the notes of assistant Arthur Schott, who was charged with the lineal surveys of the river from Devil's river to Ringgold Barracks, and from my own observations.

The navigation of the river between Edinburgh and Roma is not free from obstructions, but they are mostly of shifting sand-bars, except the one formed by Island 13 on the boundary map, which may be improved by damming two of the three channels. Between Roma and Bellville the obstructions are principally occasioned by Islands 15, 16, 17, and 20, dividing the channel of the river; and the navigation may be improved in the same way by damming all the channels but one, and dredging the bottom of the one left open. It is above Bellville that obstructions become of rocky character, difficult to remove, such as are to be found at Islands 25, 30, 31, 33, 35, 39; and above Loredo, at the Heron islands, Las Islitas, Cazneau island, and Chess-Board island.

The worst of these are Islands 25, 30, and the Islitas; 25 is sometimes called Major Brown's island, from the circumstance of the steamer Major Brown being detained there a whole season waiting for a rise of water; No. 30 is a couple of small islands, at the foot of which the channel is only eleven or twelve feet wide. Of the three last-named obstructions, the Islitas is the most formidable. Here, in fact, there is no channel, and the rocky islands obstructing the passage of the water can only be passed at high water from June to September.

Other obstructions besides islands are caused by numerous reefs and spurs of rock. Just above Bellville there is a formidable obstruction of this kind, marked by the wreck of the steamer "Exchange;" this obstruction is formed by two reefs running in from the opposite sides, and overreaching each other, thus leaving but a crooked channel, through which the river passes at the rate of five miles per hour. A similar obstacle occurs about fifteen miles below Eagle Pass.

Other reefs occur running entirely across the river, and are disposed in steps, one above the other. In seasons of excessive dryness they are bare of water. Of such character are the obstructions noted in the field-notes of Mr. Schott as "the snares," "the meshes," "the stone turtles," and the "Devil's pen," all situated between the Islitas and Eagle Pass.

In most cases the rocks forming the obstructions are sedimentary rocks of the upper cretaceous age, lying in horizontal strata; these would yield easily to the pick. How far it would be prudent to resort to cutting away these natural dams, as a mode of improving the navigation, which would necessarily lower the pools above, would be a subject of investigation for each locality. My object in this report is only to present a general view of the character of the difficulties in the way, and to present such maps as would render unnecessary any general survey of the river hereafter.

Except where interrupted by arroyos, the country is uniformly level, no hill breaking the general view until we reach Eagle Pass; and it may be that in time the resources of the country will be sufficient to justify its connexion by railroad with San Antonio or Brownsville, in which event the improvement of the navigation of the river will become of minor importance.

Ascending beyond the mouth of the San Pedro or Devil's river, the whole character of the

country changes. The bed of the river becomes hemmed in by rocky mural banks, the tops of which are beyond the reach of irrigation, and, from the aridity of the climate, they can never be made subservient to the purposes of agriculture. The general formation of the country is limestone, deposited in strata perfectly horizontal, and where the river has washed its way through the banks, presents the appearance of gigantic walls of dry-laid masonry. The course of the river from this point up to Fort Leaton, near the Presidio del Norte, a distance of 387 miles, is almost one continuous cañon, utterly unsuited to navigation, and, with a few exceptions, unsuited for settlement. Occasionally this limestone formation, over 1,000 feet in depth, is broken through and upturned by igneous irruptions from below, forming stupendous mountains and gorges of frightful sublimity. I leave to the officers under my command, who so bravely surveyed these chasms heretofore untrodden by white men, and probably by Indians, the task of describing in detail this section of the work, which was only visited by me at certain places to determine the latitude and longitude.

My notices have been principally confined to the Texas side of the boundary. Before leaving the mouth of the Rio San Pedro to ascend the Rio Bravo, I will take a rapid view of the country on the Mexican side between this point and the Gulf. The most prominent topographical feature is a chain of lofty mountains of unequal elevation which cross the Rio Bravo about 250 miles above Rio San Pedro, and run in a southeasterly direction towards the Gulf. It is composed of a variety of ridges, preserving towards each other, and towards the river and the Gulf coast, a general parallelism. The principal range is called the Sierra Madre. The eastern slope of these mountains forms portions of the States of Coahuila, Nuevo Leon, and Tamaulipas. The area between the Rio Bravo and the bases of these slopes is an arid, cretaceous plain, covered with a spinose growth similar to that on the Texas side. Passing from this plain into the mountains, we encounter a soil made up of the debris of the older rocks, and watered profusely by limpid streams having their sources in the crystalline rocks. And here, in the valleys formed by these mountains, we find large tracts of country within the influence of some irrigating stream, sheltered from the northers of the winter, and at an elevation above the sea sufficient to overcome the excessive heat of the summer due this parallel of latitude, producing all the fruits of the tropics and the cereals of the more northern climates. The climate is unsurpassed in salubrity, and nothing is requisite to make this region the garden-spot of the valley of the Rio Bravo but a stable form of government and security from the bands of roaming savages that plunder it at intervals.

In the more northern portions, as at Parras, the vine is grown with success, and a luscious wine is made, which, however, will not bear transportation. On the seacoast and southern portion, commencing at Santa Rosa, oranges, limes, &c., are cultivated successfully. Some of the mountains are rich in silver, and at Santa Rosa, as has been elsewhere noticed, the mines were once extensively worked by the Spaniards, and have now passed into the hands of an American company.

In no civilized country are statistics more difficult to obtain than in Mexico, and several attempts to obtain the population of this region, composing the largest portion of the States of Nuevo Leon, Coahuila, and Tamaulipas, have resulted in such discrepancies as to induce me to give credit to none. I have, however, made an estimate of the resident population of the Rio Bravo on both sides, from the Devil's river down, which I here present. This estimate is rather under than over the number, which has heretofore been registered too high:

MILITARY COLONY OPPOSITE FORT DUNCAN, TEXAS

Eagle Pass	300
Piedras Negras	600
Loredo	700
Colonia Militar	50
Loredo Nuevo	700?
Mier	700
Roma	400
Guerero	600
Camargo	500
Rio Grande city	500
Reynosa	600
Brownsville	3,000
Matamoras	4,500
Burrita	300
Lomita	200
Rancherias at different points on the river	6,060
Total	20,210

Table of distances along the course of the river.

Names of places.	Distance between places.	Distance of each place from mouth of Rio Grande.
	Miles.	*Miles.*
Mouth of Rio Bravo		
Brownsville	49.81	49.81
Edinburgh	120.36	170.17
Ringgold Barracks	71.21	241.38
Roma	16.67	258.05
Bellville	45.93	303.98
Fort McIntosh	61.46	365.44
Falls of Presidio de Rio Grande	90.44	455.88
Fort Duncan	39.77	495.65
Mouth of Rio San Pedro	71.12	566.77
Mouth of Rio Pecos	41.48	608.25
Point where Lieut. Michler came to the Rio Bravo from San Antonio road	96.88	705.13
Point of beginning of Lieut. Michler's survey in 1853	49.05	754.18
Presidio de San Vincente	67.61	821.79
Presidio del Norte	132.00	953.79
Cañon on San Antonio road	222.78	1,175.57
San Ignacio	60.89	1,236.46
San Elceario	40.25	1,276.71
El Paso del Norte	25.38	1,302.09
Initial point of boundary where it leaves the Rio Bravo, running west	3.41	1,305.50
Frontera observatory	2.70	1,308.20

CHAPTER V.

FROM MOUTH OF DEVIL'S RIVER TO EL PASO DEL NORTE.

PECOS SPRINGS.—KING'S SPRINGS.—INDEPENDENCE CREEK.—RIO BRAVO INACCESSIBLE.—LIPANS.—CAÑONS AND RAPIDS.—MOUTH OF THE PECOS.—DEVIL'S RIVER.—DIFFICULTY OF NAVIGATION.—CAÑON OF BOFECILLOS.—COMANCHE PASS.—SAN CARLOS.—MOUNT CARMEL AND LOS CHISOS.—SAN VINCENTE.—PRESIDIO DEL NORTE.—VADO DE PIEDRAS.—TOWNS NEAR EL PASO.

The description of the boundary, up the river, is continued by the following reports of Lieutenant Michler and assistant Chandler:

WASHINGTON CITY, D. C., *March* 10, 1856.

SIR: The following is an extract of your orders to me, dated Washington City, D. C., April 4, 1853: "You are charged with the responsible duty of completing the unfinished portion of the survey of the Rio Grande, which forms the boundary between the United States and Mexico, between Fort Vincente and the mouth of the Rio Pecos."

Soon after their receipt the survey was commenced, and in the following August completed. Since then the maps have been finished, and several views of the scenery in the immediate locality of the work engraved.

I now have the honor of submitting a report of the manner in which the survey was conducted, and a description of that portion of the river, and the country adjacent.

Having organized a party, and made all preparations at San Antonio, Texas, we proceeded on the road to El Paso, and followed it as far as the Pecos Springs. At this place I determined to leave the road and strike for the Rio Grande, as directly as the nature of the country would permit. Owing to its character, and the necessity of taking wagons along, our route, as shown by the map, became somewhat circuitous. For the first fifty miles, from the Rio Pecos to King's Springs, the course was nearly due west, enabling us to avoid the many impassable arroyos setting in towards the former river. The road ran the greater part of this distance in small narrow valleys, gradually ascending towards their heads, passing from one into another, over high ridges, by precipitous ascents and descents. These valleys are bounded by chains of hills, either of a conical or oblong shape, the tops of which are on the same level and capped by horizontal layers of cretaceous limestone; the slopes are regular, well rounded, and steep. From the ridges, or high plains, which are generally very narrow, valleys ramify in every possible direction towards the Pecos. The grass is rich and luxuriant; low, scrubby bushes are found, but no growth of timber. No water, except what collects in the gullies during heavy rains, until you reach King's Springs. This is a large spring of water, deep and clear, with a fine gravel-bottom, and well protected from the sun by shelving rocks, but without bush or tree to mark its place. Whilst the main party encamped there, a reconnoissance was made in a so thwesterly direction for nearly sixty miles, when it was found impracticable to proceed

further. The course lay towards the "Los Chisos" mountains. The country is cut up by immense chasms, closed in by steep cliffs, unseen until standing upon the very edge of their fearful depths; rugged hills, covered with sharp igneous stones, make it difficult for animals to travel. The same volcanic formation as found along the Limpia extends over this section of country. The San Carmel range appears in the distance—high mountains, with their turreted peaks, could be seen, presenting a magnificent prospect like the spires of some distant city. Our efforts to travel in a southwesterly direction having proved unsuccessful, on leaving King's Springs we changed our route to a southeasterly one, and arrived at Independence creek. Along this distance of forty miles the country is of the same character as that first passed over. Whilst the train remained on the creek, a small party made examinations in advance. This is a beautiful stream, running boldly among the hills, and is fed by innumerable springs bursting out from its banks. It is a rich treat for the eye in that arid country. Besides a copious supply of fresh, clear water, there is more timber than is ordinarily found upon streams draining these high plains; mezquite trees grow in large numbers for miles around, and the valley furnishes luxuriant grazing for animals. This place is much frequented by Indians; an oasis in a desert country.

Numerous trails from the Pecos and the Escondido here unite and form a large broad one, running south to the Rio Grande; there are unmistakable signs of their constant use. Leaving the creek, we ascended the contiguous hills and rose upon a high plain, over which we travelled forty miles, following the guidance of the Indian trail; this was deeply marked, although it

Lipan Crossing—Eighty-five miles above the mouth of the Pecos.

is difficult to make an impression on the surface. It was a dreary sight to look upon the dull, wide waste around us; its parched barrenness, combined with the influence of a scorching July sun, was enough to madden the brain. The nearer we approached the river, the more rough the country became; deep ravines and gullies constantly impeded the progress of the wagons,

and the whole surface was covered with sharp angular stones and a growth of underbrush armed with thorns. Along this portion of the route, we found plenty of water in tanks at the heads of the ravines. There were, also, many fine springs. One in particular is noticeable for its beauty; falling over a precipice of forty feet, its waters were emptied into a large basin worn out of the solid rock. This was a favorite camping place of the Indians; the many paintings of men and animals found covering the rocks, testify to their rude attempts in the artistic line. The last ten miles kept gradually descending towards the river; occasionally the wagons had to be let down steep descents by means of ropes. Our road finally emerged upon a low flat plain about twenty feet above the level of the Rio Grande. We had, fortunately, struck the only place, as our examinations afterwards proved, where we could possibly reach the river with our wagons; the route was a circuitous one, in all 140 miles from the Pecos springs. The initial point of our work was found to be a little over forty miles above; the surveying party of the previous year had there suspended operations in consequence of the rugged character of the country, and had returned to Eagle Pass through Santa Rosa and San Fernando, Mexico. It was next to an impossibility to approach the river for the first twenty miles of the survey, this section being literally cut up by deep arroyos; steep hills, covered with rocks of igneous origin, intervene and jut into the water's edge. The river here is very tortuous. From the end of this section, the country undergoes a great change; the formation is limestone, and the river forces its way through a deep cañon nearly twenty miles in length, its banks being composed of

Lipan Crossing—View down the river.

high perpendicular masses of solid rock, resembling more the work of art than of nature. Arroyos of the same structure, at many places, open into the river; in following its course, we had frequently to make detours of twenty-five and thirty miles, in order to advance our work a few hundred feet. The plain where the main party encamped, and where we first struck the river, made a gradual descent to the water. Here was the first break in the cañon, and the

crossing being fordable, formed an accessible pass for the Indians into Mexico. This ford, known as the Lipan crossing, is represented by the preceding sketches.

The Lipans often visited us here, and made themselves useful as guides. As it proved to be impracticable to conduct the survey on land without taking an interminable length of time, it was decided to make the attempt in the bed of the river; anticipating such an emergency, boats had been built at San Antonio and brought along in wagons. After they had been put together and launched, and everything in readiness, the train was sent back by the road to Eagle Pass, there to meet the small party selected to descend the river to the same point. Upon trial, we found the boats, which were our only resource, would float—the only thing that could be said in their favor. The wood of which they were made was only partially seasoned, and the hot sun had so warped them, that they presented anything but a ship-shape appearance. The two skiffs were frail—a moderate blow would have knocked a hole in them—and the flat-boat was unwieldy and unmanageable. The current was so strong that two good oarsmen could not stem it in a light skiff. At the point of embarkation was a short break in the cañon of a few hundred feet on both sides of the river; the water then again rushed between rocky banks ten or twelve feet high, which increased in height as we proceeded. It would seem incredible that the bed of the stream could have been formed through ledges of solid rock, as shown in the accompanying sketch.

Cañon—One hundred and five miles above mouth of the Pecos.

The occurrence of a freshet whilst encamped on its banks, however, convinced me of the impetuosity of its waters, which appeared to force everything before them. The bed is narrow, and hemmed in by continuous and perfect walls of natural masonry, varying from 50 to 300 feet in height; the breadth of the river being extremely contracted, these structures, seen from our boats, look stupendous as they rise perpendicularly from the water. It is not unfrequently the case that we travel for miles without being able to find a spot on which to land. The limestone

formation is capped by an infinite number of hills, about 150 feet in height, and of every imaginable shape. The whole adjacent country is traversed by deep arroyos or cañons, intended by nature to drain the high plains bordering on the river; they are, in their appearance, but miniature creations of the same power which forced a passage for the Rio Grande. Their junctions with the river form large rapids or falls, caused by the rocks and earthy matter washed down them. These rapids are numerous, many of them dangerous, and will always prove insurmountable obstructions to future navigation. The force of the current is very great, and for thirty miles above the mouth of the Pecos is one continued rapid; its average rate is nearly six miles an hour. The width of the river varies from 80 to 300 feet, and at a few points narrows down to 25 and 30; when confined between its rocky walls the channel is very deep. There are no tributaries along this section of the work, but several fine springs contrast their clear blue with the muddy waters of the river. There is but little growth until the approach to the mouth of the Pecos; a narrow strip of soil is then occasionally found at the base of the rocks, and gives growth to some fine live-oak and mezquite trees; grape-vines flourish in abundance, yielding a very palatable fruit. Catfish were the only kind of fish caught, some of them very large and heavy. Soft-shell turtle

Junction of the Rio Bravo del Norte and the Pecos.

abound. But few varieties of game were seen; the wild turkey in large numbers, and some few deer—the latter of the black-tail species. The only practicable way of making the survey through the cañon was by allowing the boats to drop down the channel, taking the direction of the courses and timing the passage from bend to bend; when opportunity offered, the speed of each boat was ascertained by distances accurately measured on land, making allowances for change of current and other causes of error. Observations for time and latitude were taken every night to check the work. On arriving at the mouth of the Pecos, a view of which is given above, the survey, 125 miles in extent, was completed. The Pecos is more deserving of its other Mexican name, "Puerco," for it is truly a rolling mass of red mud, the water tasting like a mixture of

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LIPAN—WARRIOR.

every saline ingredient; its banks are like those of the Rio Grande for some distance above its mouth, and then become low and flat. As we continue to float down stream, we find the country below the junction undergoes some very considerable changes; these become still more apparent on reaching the San Pedro or Devil's river, whose waters form a dividing line between two distinct portions of country. The banks of the Rio Grande here present an entirely new appearance—they become low, and prairie land, covered with mezquite, extends as far as the eye can see; numerous well timbered and beautiful streams unite their waters with the river along this portion. Within a few hours of each other, both the party in charge of the train and the boat party reached Fort Duncan, near Eagle Pass, 110 miles by the river below the mouth of the Pecos.

View of Fort Duncan, near Eagle Pass.

To add to the interest of the expedition, a constant excitement was experienced in the descent of numerous falls. Ignorant of what unforeseen dangers awaited us, our frail boats were dashed blindly ahead by the force of a swift current over rocks and rapids, hemmed in on both sides by insurmountable walls which seemed mountain high, and at times not a spot upon which to rest a foot; there was but little chance of escape from destruction, letting alone the immediate peril of drowning in case of any accidents to the boats. Nor were these dangers imaginary—a serious accident, and one almost fatal to the success of the expedition and to the lives of most of the party, occurred the very first day after taking to the boats; notwithstanding every precaution had been taken, we were unable to avoid it, and our minds were most forcibly impressed with the truth that real dangers did exist. After having descended the river for a few miles an immense rapid presented itself to our view. The river here narrowed from nearly three hundred feet to the width of twenty-five; both shores could be touched with the ends of the oars; an immense bowlder divided the main into two smaller channels, leaving but a narrow chûte for the boats to descend. The bottom was covered with large rocks, and over these the

whole mass of water rushed, foaming and tumbling in a furious manner; a dangerous rapid was thus formed of several hundred feet in length, extending from bank to bank. The two skiffs made the descent in safety, although the waves rolled so high that each plunge filled them almost to overflowing. The flat-boat was not so fortunate; totally unmanageable, she ran square against the rocky walls, splintering and tearing away her entire front; such was the force of the blow that the crew were knocked flat on their backs, and the boat-hooks left firmly imbedded in the crevices of the rocks. Thrown back by the great swell, she commenced floating stern foremost down the rapid, gradually sinking. The men stuck to her faithfully, and the skiffs were put into immediate requisition; but by the expert swimming of two of the men, both Mexicans, who had dashed into the current ere the sound of the crash had died away, and seized her lines, she was landed on the end of a sand-bar which most providentially lay at the foot of the rapid; a few feet further, both men and boat would have been destroyed, and our all—provisions and ammunition—irrecoverably lost, the perpendicular banks offering no foothold where to land. With means at hand to repair the wreck, we were again afloat the following day, our craft bereft of all her fair proportions.

Before closing this report, I cannot refrain from informing you of the very able and willing assistance rendered me by my assistants, Messrs. E. A. Phillips and E. Ingraham, and Prof. Conrad Stremme; and of the patience and perseverance displayed by them and the men composing the party, under circumstances most peculiarly trying.

I am, sir, very respectfully, you obedient servant,

N. MICHLER,
Lieut. Corps Topographical Engineers, U. S. A.

Major W. H. EMORY, U. S. A.,
U. S. Commissioner.

SAN VINCENTE TO PRESIDIO DEL NORTE.

FORT DUNCAN, *December* 1, 1852.

SIR: In accordance with your directions, I have the honor to make the following report on the topographical survey of that portion of the Rio Grande intrusted to my charge. The survey commenced a few miles above Fort Leaton, in the neighborhood of the Presidio del Norte, and extended to a point about one hundred and twenty-five miles above the mouth of the Rio Pecos, embracing a section of country which for ruggedness and wildness of scenery is perhaps unparalleled.

The appearance of the valley in the vicinity of Fort Leaton, with its succession of plains and arable bottoms, forms a contrast to the rugged country beyond. From this valley, which is from one to three miles wide on each side of the river, we suddenly enter the range of the Bofecillos mountains, through which the river has found or forced a passage, forming extensive rapids at its entrance.

A narrow path along the river on the American side is the only means of passage in the immediate vicinity of the stream; and numerous rocks and branches of trees obstruct even this narrow trail.

The cañon of the Bofecillos mountains is less rugged in its character than those met with subsequently. Although the passage of a mule train on the immediate borders of the river is utterly impossible, there is on the American side a valley extending nearly parallel to the course of the stream, at a distance varying from two thousand to three thousand feet; along this passes an extensive Indian trail, but to all appearances not recently used. Dangerous and long

Entrance to Cañon Bofecillos, Rio Bravo del Norte.

rapids occur where the river leaves the cañon, and the country loses entirely the features which characterize the north side of the Bofecillos range. The hills approach and recede from the river in varied succession; nearly always, however, admitting of the possibility of carrying the line of survey along the river bottom, at least as far as the Comanche Pass. Scarcely a tree or branch of the smallest size marks the hill-sides or summits, and it is only on the immediate border of the river that the eye, wearied by the continued succession of sterile plains, is relieved by the sight of verdure; and this only when the rocky barriers recede sufficiently for a narrow strip of soil to form.

Comanche Pass, on the Rio Bravo, the most celebrated and frequently used crossing place of the Indians, was found to be just below this Bofecillos range; here broad, well-beaten trails lead to the river from both sides. A band of Indians, under the well known chief Mano, (hand,) crossed the river at the time of our visit; they had come, by their own account, from the head-waters of Red river, and were on their way to Durango, in Mexico—no doubt on a thieving expedition.

At this pass the hills on either side are less elevated, and to the northwest the depression seems to extend many miles. Below the crossing the river passes through a country varying but little from that which was met with above. The San Carlos mountains rise in front to a considerable height. The strips of bottom land now become narrow, and occur at longer intervals.

The passage of the river through these mountains is grand and imposing. The entrance is shown in the accompanying sketch; dashing with a roaring sound over the rocks, the stream, when it reaches the cañon, suddenly becomes noiseless, and is diminished to a sixth of its former width; it enters the side of this vast mountain, which seems cut to its very base to afford a

Entrance to Cañon of San Carlos, Rio Bravo del Norte.

passage to the waters. On the right of the entrance, the rock is rounded and smoothed by the action of the water into an artificial appearance; on the opposite side the mountain receives the river in its full force. It is impossible to keep along the edge of the stream in its course through the mountain, and just as impossible to navigate it. The rapids and falls which occur in quick succession, make the descent in boats entirely impracticable.

A detour by San Carlos was rendered necessary, and the river was again reached at a point some twenty miles below the lower termination of the cañon. It is in the passage through these mountains that the well defined "rapids of the Rio Grande occur," which from their extent, and their near approach to a perpendicular line in their descent, merit the name of "falls." From the edge of the cañon the river may be seen far below, at a distance so great as to reduce it in appearance to a mere thread; and from this height the roar of the rapids and falls is scarcely perceptible.

It was impossible to approach them in consequence of the rugged nature of the country; the fall of the river at this point, however, may be estimated at twelve feet, without including the rapids above and below. The stream is hemmed in by the cañon for ten miles, and then leaves it with the same abruptness that marks its entrance.

It was here found necessary to cross the mule train from the Mexican side, where it had travelled since the commencement of the survey. This was effected, though with considerable difficulty, at one of the usual crossings of the Indians. Near this point, for some distance above

and below, the country is more open, the valleys broader, and are susceptible of cultivation; the bottom land is, however, limited by an elevated bank of gravel. There is also an abundance of cottonwood and mezquite timber.

Whenever the spectator was elevated sufficiently to see beyond the valley of the river, two prominent peaks were always presented to his view: one of these marks a summit in the range of the Mexican Sierra Carmel; and the other, from its peculiar shape and great height, was long and anxiously watched during the progress of our survey. From many places on the line it was taken as a prominent point on which to direct the instrument; and, though the face of the country might change during our progress down the river, still, unmistakable and unchangeable, far above the surrounding mountains, this peak reared its well known head. The windings of the river, and the progress of our survey, led us gradually nearer to this point of interest, and it was found to be a part of a cluster, rather than range, of mountains on the American side, known as "Los Chisos." For this peak, a view of which is here given, we have proposed the name of Mount Emory.

Mount Emory—Los Chisos mountains—Rio Bravo del Norte.

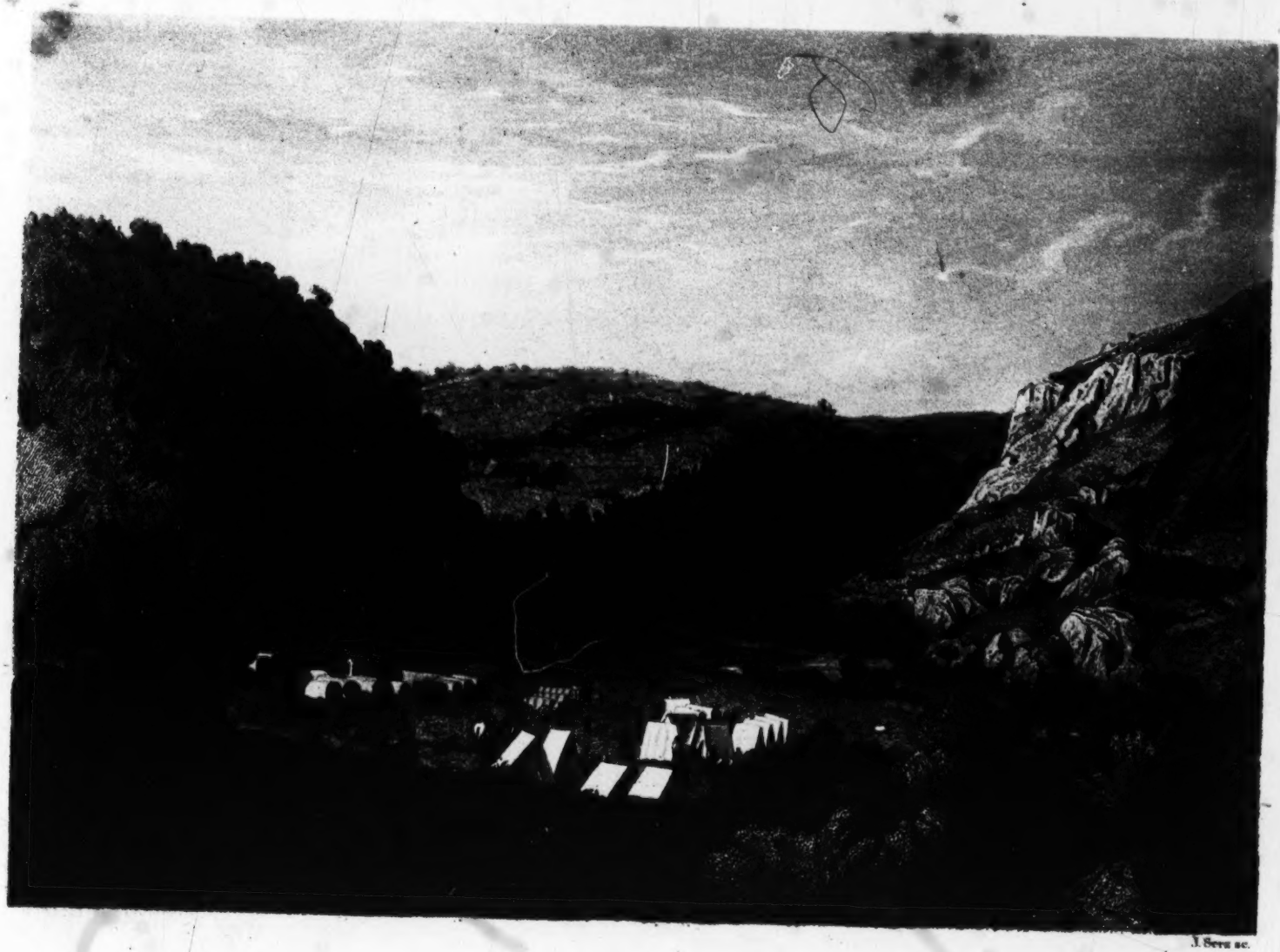
After passing this range of mountains, the survey was carried on with less labor than was previously encountered until we reached the Sierra San Vincente. Through these mountains the river forces its way, forming a cañon that equals the San Carlos in many places both in ruggedness and grandeur. A small party only could attempt the survey of this part of the line; and the command was divided, one party accompanying the mule train, and the other, under my personal charge, crossed the mountains. Here we experienced another series of falls or sharp rapids far down in the abyss along which the river finds its difficult course; the roaring of the waters announced a more than usual disturbance, and the boats soon encountered difficulties which, for one of them at least, were insurmountable. In this, as in other cañons, it was impossible to carry the line nearer the bed of the river than the summits of the

adjoining hills. Two days were necessary to enable the train to make its passage through this canon, [illegible] country extending nearly [illegible] an side of the river. [illegible] er bottom, is situated [illegible] at marked the Spanish [illegible] ling to decay, and scarc[illegible] art devoted to the chapel. [illegible] inguished by a survey flag, [illegible] lers, for Señor Salazar, of th[illegible]

Continuing th[illegible] t what in the distance seemed to [illegible]

It proved to be a c[illegible] t insurmountable obstacles. Passin[illegible] the course of the river, preceded the [illegible] so rocky dungeons in which the Rio Grand[illegible] No [illegible] give an idea of

the grandeur of the scenery through these mountains. [illegible] often the bare and rugged view; no overhanging tree or green bushes [illegible] one of perfect desolation. Rocks are here piled [illegible] greatest labor that we could work our way. [illegible] short distance for the pack-train [illegible] als, and the spirit of the wh[illegible] nd clothing, had reduced [illegible] cely afforded enough covering for decency. The sharp rocks of the mountains had cut the shoes from their



J. Serra sc.

LIMPIA — WILD ROSE PASS

feet, and blood, in many instances, marked their progress through the day's work. Beyond the Sierra Carmel the river seemed to pass through an almost interminable succession of mountains: cañon succeeded cañon; the valleys, which alone had afforded some slight chances for rest and refreshment, had become so narrow and devoid of vegetation that it was quite a task to find grass sufficient for the mules. At a point some few miles below Sierra Carmel, it was supposed that a better pathway could be found on the Mexican side of the river. Just above the entrance of the river into a small cañon a place was chosen, which seemed to afford the most feasible opportunity for fording the river. With great difficulty the whole train was passed over without loss. With this slight interruption, the line of survey was carried on until it reached a point since shown to be about one hundred and twenty-five miles above the mouth of the Pecos. Here the work was suspended, owing to the failure of provisions and the means of transportation on the river. With the whole party we passed down on the Mexican side through the town of Santa Rosa, and arrived at Fort Duncan after a long and tedious journey. It is but proper, in justice to Messrs. Thompson and Phillips, the gentlemen associated with me as assistants, to mention their names as an expression of my appreciation of their exertions. To Mr. Phillips, for his able assistance and unvarying industry, I feel especially indebted.

I have forborne any but an incidental allusion to the difficulties of the survey under my charge, leaving it for yourself, so well acquainted with the character of the country gone over, to appreciate these difficulties, and thus excuse any deficiencies that may have occurred in the work.

I have the honor to be, very respectfully, your obedient servant,

M. T. W. CHANDLER,

Assistant in charge of party U. S. and Mexican Boundary Commission.

Major Wm. H. Emory,

Chief Astronomer and Surveyor U. S. and Mexican Boundary Commission.

PRESIDIO DEL NORTE.

We arrived in front of the Presidio del Norte July 8, 1852, and found watermelons ripe and the corn in tassel. The town, isolated and very remote from any other settlement, had been suffering from famine. The Indians had run off most of the cattle, and the drought for the three preceding years had caused a failure in the corn.

The Presidio is a miserably built mud town, situated upon a gravelly hill overlooking the junction of the Conchos and the Rio Bravo—the latter called here the Rio Puerco, no doubt from the contrast of its muddy waters with those of the Conchos, which, except during freshets, is limpid. The town, which contains about eight hundred souls, is one of the oldest Spanish settlements in northern Mexico; but from the barrenness of the soil, an attempt is making to settle a military colony forty miles higher up the Rio Bravo, where the land is supposed to be better adapted to agriculture.

The church is within the walls of the Presidio, or fort, and contains one or two paintings of a better class than are usually found disfiguring the walls of frontier churches. In almost every house is found, in addition to the cross, a figure of our Saviour, which is sometimes so very grotesque that piety itself cannot divest it of its ridiculous appearance.

These customs, however, are a source of comfort and happiness in prosperity and in adversity, in youth and in old age. They fill the imagination and give occupation to the idle, as the light literature of the day serves the more cultivated races. The padre who presides over the church in this district was by nature intended for the military profession. Brave, frank, handsome, and energetic, he is the leading spirit in every foray against the Indians, and is by no means an insignificant person in the trade of the place. He bears on his person more than one wound received in battle. In the present isolated and defenceless state of the Presidio, this gentleman is nevertheless as good a spiritual and temporal adviser as could be desired.

The relations between the Indians of this region and several of the Mexican towns, particularly San Carlos, a small town twenty miles below, are peculiar, and well worth the attention of both the United States and Mexican governments. The Apaches are usually at war with the people of both countries, but have friendly leagues with certain towns, where they trade and receive supplies of arms, ammunition, &c., for stolen mules. This is undoubtedly the case with the people of San Carlos, who also have amicable relations with the Comanches, who make San Carlos a depôt of arms in their annual excursions into Mexico. While at the Presidio we had authentic accounts of the unmolested march through Chihuahua, towards Durango, of four hundred Comanches under Bajo Sol. It seems that Chihuahua, not receiving the protection it was entitled to from the central government of Mexico, made an independent treaty with the Comanches, the practical effect of which was to aid and abet the Indians in their war upon Durango.

In the fall of 1851 I had the honor of entertaining at my camp the excellent and reverend Bishop Leamy, who was then on his return from a visit to the Bishop of Durango, to adjust the territorial limits of their respective dioceses to make them conform to the altered boundaries of New Mexico and Texas. He stated as his opinion, that the wealthy State of Durango must soon be depopulated by the Indians. Haciendas within a few leagues of the city, that once numbered one hundred thousand animals, are now abandoned.

This condition of things, together with the three years' drought, had overwhelmed the inhabitants of that State, and had driven them to unmanly despair. On the occasion of a great fiesta in the city of Durango, where no less than ten thousand people were assembled in and around the plaza, the cry was heard of Los Indios! Bajo Sol! and in a very short time every one had retreated to his house, leaving no one to face the enemy. The enemy, however, did not appear on the occasion, for it turned out to be a false alarm.

"Bajo Sol" is the title assumed by a bold Comanche, who, as his name signifies, claims to be master of everything under the sun. His name, which strikes dismay into every heart throughout Durango, is mentioned only in a whisper. I have never seen the villain or heard his name on the American side, where he probably takes another soubriquet; but I did meet one of his lieutenants, who, I have no doubt, was in all respects a worthy disciple. I give here a sketch of this rascal, by Mr. Schoo.: He called himself "Mucho Toro," and represented himself as a Comanche, but he was evidently an escaped Mexican peon. It was in the fall of 1851, in making a rapid march across the continent, escorted by only fifteen soldiers under Lieut. Washington, as we approached the Comanche springs after a long journey without water, that we discovered grazing near the spring quite one thousand animals, divided into three different squads. As we approached we could see with the naked eye a party of thirty or forty warriors drawn up on the hill overlooking the spring. I considered it inevitable to fight, or die with thirst; so, without making a halt, the men were deployed to the right and left of the wagons as light

infantry, and the whole moved rapidly towards the water. A flag was raised by the Indians, which was answered by Lieut. Washington and two others riding forward; but believing it a ruse to divide our forces, or give time to deliberate, I quickened the speed of the column, so as to keep Lieut. Washington under cover of our fire; so that we reached the ground and got within pistol-shot of the water before we halted to talk. A man was sent to the top of the hill with a spy-glass to look back, as if additional force was expected. We promptly corraled our wagons near the water, and put ourselves, without appearing to do so, in a good position to fight. We succeeded, without so stating, in producing the impression that we were only the advanced guard of a large force which would come on the next day, and possibly that night. We assumed all the air of the superior party, staid eighteen hours on the ground, and moved off the next day, as if we had a regiment to back us.

The party were Kioways and Comanches, returning from a foray into Mexico with nearly one thousand animals. "Mucho Toro," the chief of this party, who spoke Spanish well, stated he had purchased his animals in Mexico, and that he was but the advanced party of several hundred warriors, who were close behind him. We desired very much to attack the party, but our force was too small, and we were three hundred miles from support. The next day, when crossing the dividing ridge between the Comanche and Leon springs, we discovered the dust rising from the trail which crossed our road as far as the eye could reach, leaving no doubt of the truth of "Mucho Toro's" statement, that his was but the advanced party of "Bajo Sol's" four hundred men. The following summer we found that such a party had passed out of Mexico over this road.

View of Gomez Peak, from near Fort Davis.

"Mucho Toro" paid me a visit in full dress, on which occasion he displayed great humility, exhibiting conspicuously on his person an immense silver cross, which he stated had been given him by the Bishop of Durango when he was converted to Christianity. He had, no doubt,

robbed some church of it. His features showed the profile of the Mexican Indian peon, but the warriors he commanded had the bold aquiline profile of the Kioways and Comanches. I present him as a type of that class of Mexicans who, by affiliation with the wild Indians, have produced such irreparable ruin to the northern States of Mexico.

We heard of many such parties, and encountered many adventures similar to that just narrated, but I shall not trouble the reader with any reference to these rascals, or our adventures with them, except to say that I never trusted them; and during the last year of my experience with them I gave orders to permit none to come into any camp under my orders, and to kill them at sight. By taking this harsh but necessary step, I was the only person passing through this country who did not incur difficulty and loss. The Mexican commission was robbed repeatedly, and on more than one occasion was, in consequence, obliged to suspend its operations.

The Rio Bravo, accommodating itself to the geological formation of the country, makes, between the 100th and the 104th meridian of longitude, two great bends nearly symmetrical, one to the south and the other to the north. The area included in the southern bend is one vast cretaceous bed, upheaved by igneous protrusions, sometimes forming ranges of mountains, as the Limpia range, and at others isolated peaks, like Gomez Peak and San Jacinto. To the east and north of the Leon springs the limestone beds are in repose, and do not appear disturbed until we get to Las Moras.

It is, generally speaking, very destitute of water, and the excess of lime in long continued droughts often destroys vegetation. There are, however, oases of surpassing beauty, such as that described in Lieutenant Michler's journal. There is another on the road which I opened

Site of Fort Davis—Limpia Mountains.

from the Presidio del Norte to the Leon springs, called the Puerto del Paisano. This is a valley on the northern slope of the principal range of the Limpia mountains, watered by a limpid stream from crystalline rocks, clothed with luxuriant grass, sufficient to graze a million of

Arthur Schott del. Lith. of Sarony & C° New York.

TORO · MUCHO.
CHIEF OF A BAND OF KIOWAYS.

cattle. On the hill-tops overlooking the valley, live oak and pine grow in abundance, but are much distorted and wind-shaken, and generally unfit for building purposes.

This road, which will be found traced on the map, was opened for the double purpose of communicating with my parties on the lower Rio Grande, and of shortening the distance from San Antonio to Chihuahua. The route followed by the merchant trains is by the way of El Paso, a distance greater by 300 miles. It is possible a shorter route may be found, but our explorations led us to believe this was the shortest one where a permanent supply of water could be obtained.

Fort Davis has been established since our survey. There is now a constantly travelled road connecting Fort Davis and Chihuahua, via Presidio del Norte.

Several other roads have been opened through this region—one other by myself, one by Colonel Johnston, and one by Lieutenant Michler; all having for their object a more direct communication with the lower Rio Bravo. A good wagon road is said to exist along the Comanche trail, figured on the map, but this I doubt.

The area included in the southern bend forms of itself a distinct drainage, and is one of those basins peculiar to the interior of the continent. It is called by the Mexicans the Bolson de Mapimi, and its waters run into the Lake Jaqui, the rendezvous and stronghold of the Comanches and Kioways, who annually plunder Durango and the neighboring States of Mexico. It is here they collect and divide the plunder, consisting of women, children, and animals. Here, also, they leave their rifles, depending alone upon the lance in their depredations upon the Mexicans.

The immediate neighborhood of the Presidio del Norte, situated in the southern bend above described, is very dry, owing, I think, in some measure, to the manner in which the mountains recede from the valley at that point. The summer we passed there, clouds, discharging water and electricity copiously, were almost daily seen following the ranges of mountains, about ten miles to the south, while not a drop fell upon the Presidio for some weeks. Indeed, so great were the rains to the south, that the Conchos was swollen, and about the 10th of August the whole valley of the Rio Bravo, below its junction, was inundated. This is said to occur annually.

There is sometimes an overflow in June, from the melting of the snows at the head of the Rio Bravo, and it is to these two overflows that the country is indebted for the little capacity it possesses for agricultural pursuits. A narrow belt of alluvial soil is moistened, upon which corn and vegetables are raised.

For a description of the valley of the river from the Presidio del Norte to the cañon, where the San Antonio and El Paso road first strikes it, I give an extract from the official report of assistant von Hippel:

"From Presidio del Norte to Vado de Piedras, a distance of twenty-four miles, the valley of the Rio Bravo has a course from southeast to northwest, and is from three to four miles in width. It is a good grazing country, and the soil is of easy cultivation. This valley is enclosed by hills on the American side, and on the Mexican side by a large mountain range.

"Vado de Piedras is a Mexican military colony, containing some three hundred persons. Here are large cultivated fields, which are watered by acequias, and yield abundant crops of wheat and corn. The place takes its name from the rocky ford of the river opposite the town, which is quite shallow at the ordinary stage of the water.

"Here the river takes a course nearly north, through a valley, varying in width from one-half to one and a half miles, till it comes to Pilaris, forty-five miles from Vado de Piedras. Pilaris was once a military colony, and, from abundant signs still visible, the smelting of silver ore was carried on extensively. It has long been deserted, and I could not learn from what mountains in the vicinity the ore was procured. The river continues the same general course through a valley, bounded by high ridges of mountains, for some eighteen miles, when it enters a large cañon of six miles in length. On emerging from this it changes its course to northwest, through an open valley of eight miles in length, the bearing of which is north and south.

"It now passes between low hills for some eight miles, when it breaks through an immense mountain range, where its banks are of perpendicular rock, of from four to five hundred feet in height. In this cañon are many rapids, and one fall of some six feet, making navigation impossible, except at a very high stage of water.

"One mile above the cañon, on the American side, is a level plateau of rock, about one-half mile square, near the centre of which are two warm springs, their cavities having a funnel-shape, and of great depth. The temperature of the water in them is about 180° Fahrenheit. From these springs the river continues a northwest course, through a narrow valley, for twenty-four miles, to the cañon where the San Antonio road leaves it."

From the cañon up to El Paso, a distance of eighty or ninety miles, the valley of the river will average from six to ten miles in width, and is, almost everywhere within the water-level of the river, capable of cultivation. On the American side, however, there is no settlement

Socorro, Texas.

until within a few miles of San Elceario, a distance of sixty miles from the cañon. On the Mexican side there are two small military colonies—Guadalupe and San Ignacio—of about five hundred inhabitants each. From San Elceario up to El Paso, a distance by the sinuosities of

the river of thirty miles, but by air-line of only twenty miles, is almost one continuous settlement of Mexicans and Pueblo Indians, with here and there an American farmer or trader. I estimate the whole population of the valley as follows:

El Paso	4,000
Franklin	200
Socorro	300
San Elceario	1,200
Guadalupe	800
San Ignacio	500
Total	7,000

I have included under the head of El Paso the Indian town of Sinecu, which is in the eastern part of the settlement, and is stated to have been built by the aborigines, before the occupation of the country by the Spaniards.

There are some families of pure Spanish descent in this valley, but the population is generally of a mixed character—a cross of the Indian and Spaniard. They are mostly engaged in agriculture and commerce. Before the ports on the lower Rio Bravo were opened, there was sometimes as much as two million dollars' worth of goods passed into the northern States of Mexico by the way of El Paso; at present, I suppose there is not more than $500,000 or $1,000,000, and of import about $70,000. The grapes, peaches, figs, melons, and the fruits generally of this valley, are of very superior quality. There are two descriptions of grapes—one white, the other large and blue; both are very luscious, having no trace of the musky taste of American grapes, and in skilful hands make delicious wine and good brandy. When I first visited New Mexico, in 1846, that whole country was supplied with wine and brandy from El Paso. It is now mostly consumed in the country, or sent to Chihuahua. The wine as at present made will not bear transportation, and as a general rule is but an imperfect test of what the grape can produce. The town of El Paso is itself but one extended vineyard in the hands of many proprietors. The culture of the grape, and its product of wine, would be much increased but for the difficulty of procuring vessels in which to place it for transportation. There is no wood in that whole region from which casks can be manufactured, and there is not yet sufficient demand to authorize the erection of founderies for making glass bottles.

The meteorological table which I have given in the general sketch is not a fair exhibit of the hygrometric character of this region; that record was kept in the last year of the great drought, which extended through 1849–'50–'51. In the succeeding years much more rain fell, but I had no party stationary at any one point, and therefore the record of 1851 was given as that which extended over the greatest space.

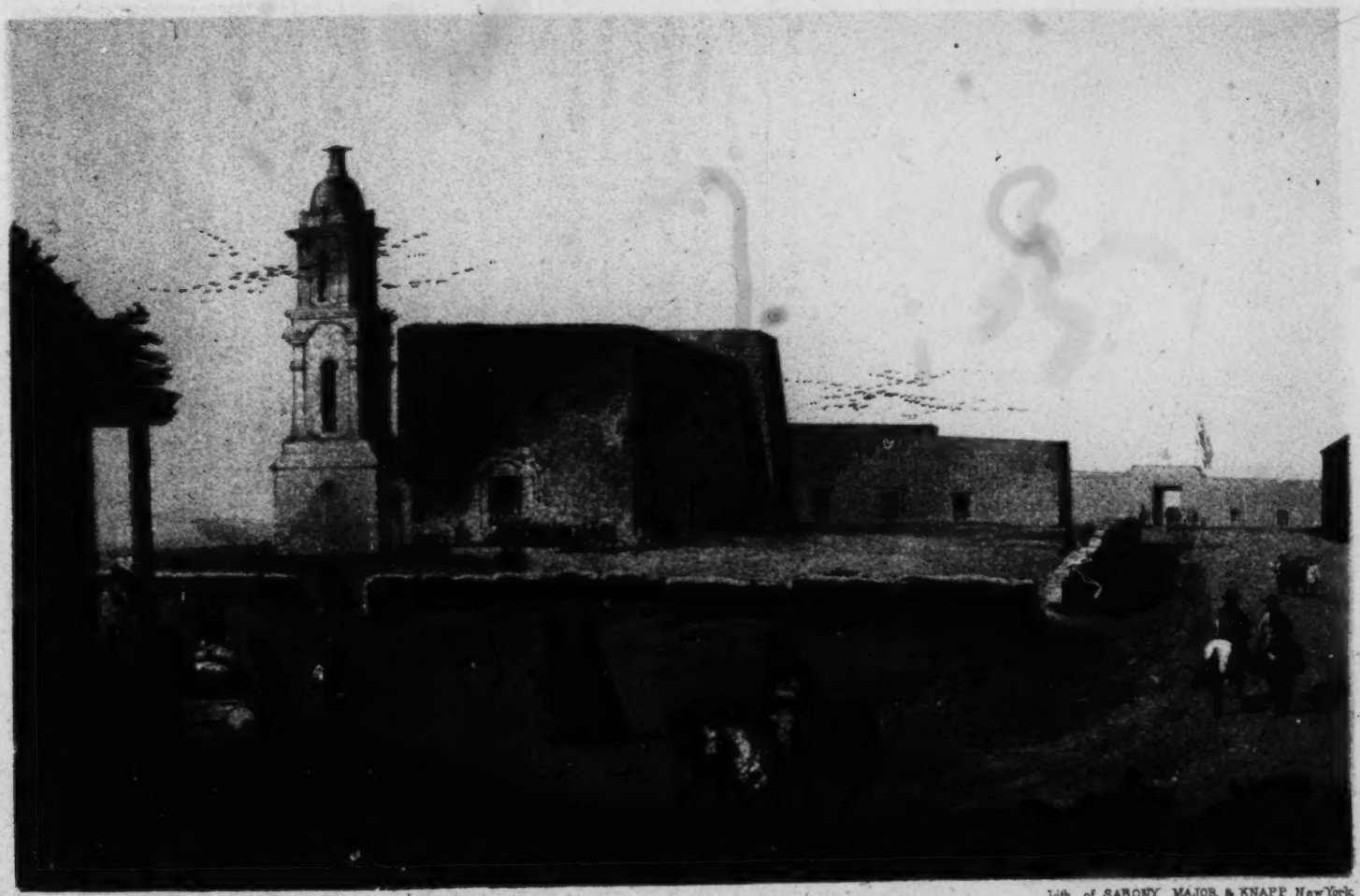
In the summer of 1852 the rains were frequent and copious. While occupied at the cañon, in the astronomical determination of that station, a deluge occurred which will long be remembered by those present.

In the middle of the night of June 25, the sky was overcast and our labors at the observatory obstructed. We had all retired to bed, when I was awakened by a roaring noise, which I supposed to be wind. I called to Mr. Burns, who was in charge of my zenith telescope, to take the usual precautions against high wind. He answered that it was not wind, but water; adding, if we did not leave camp pretty soon we should all be drowned. I had made the selection of my camp on a spot which I supposed secure from any possible inundation, but on

stepping out of my blankets, found myself knee-deep in water, which was rapidly rising. My first impulse was to seize the chronometer and note-books of the survey, and make for the small eminence upon which the observatory was placed. Only two persons were near enough to assist me, Mr. Gardner and my cook, and neither of them could swim. As we advanced, the water came up to the chin, and the soft ground under foot gave way. It was with the greatest difficulty we reached the hill with our precious load. The night was inky dark, but I caused fires to be built, when all hands immediately went to work, and by the time day broke we had secured nearly everything of value. The only public property lost was some belonging to the escort, composed of raw recruits, many of whom could not speak a word of English, and who, in the absence of their commanding officer, took to the hills, and could not be brought down till day-light. A tremendous rain on the adjacent mountain had fallen during the early part of the night, and the accumulated waters finding insufficient drainage, made for themselves a new channel, which unfortunately passed through our camp.

Throughout that whole region traces of the same kind of deluges can be found, where for months and years not a particle of running water is ever seen. These traces receive the name of arroyos, and I think may be taken generally as evidences of a country subject to long droughts, only interrupted at long intervals by heavy falls of rain.

On a more recent visit to El Paso, in the summer of 1855, the rains were very frequent and heavy. On one occasion several adobe houses were washed down, and, with few exceptions, every house in the place was damaged and rendered leaky. This town, although built in the sixteenth century, and possessing a very considerable trade, does not contain a single stone, brick, or wooden building. The houses, of one story, are built of adobe, (mud and straw,) and the tops covered with tile, grass, or mud, supported by undressed cottonwood logs. They resemble very much the ruins of the houses described in the oases of Syria, and particularly in the dimensions of the rooms, which are accommodated to the rude carpentry of semi-civilized nations. However long a room may be, it is never more than twenty or thirty feet wide, the span of a stick of timber, without the aid of king-posts.



Drawn by A. de Vaudecourt

Lith. of SARONY MAJOR & KNAPP New York

THE PLAZA AND CHURCH OF EL PASO.

CHAPTER VI.

SKETCH OF TERRITORY ACQUIRED BY TREATY OF DECEMBER 30, 1853.

AREA.—HOW WATERED.—FACE OF THE COUNTRY.—PLAYAS.—VALLEYS AND THEIR CAPACITY FOR AGRICULTURE.—ABANDONED SETTLEMENTS.—MINERAL WEALTH.—PIMOS INDIANS.—DESCRIPTION OF SKETCHES.—VIEWS.

The territory acquired under the treaty of December 30, 1853, lies between the parallels of 31° 20′ and 33° 30′, and between the meridians of 106° 30′ and 104° of longitude measured from Greenwich, and contains 26,185 square miles.

Its eastern part is bounded by the Rio Bravo; its northern by the Rio Gila. The interior of the area is traversed by two rivers, which run northwest and empty into the Gila. These are the San Pedro and the Santa Cruz.

A smaller rivulet, lying to the east of both of these, called the San Domingo, takes its rise near the middle of the territory and runs in a northwest direction, emptying into the Gila. This last named river, like the Santa Cruz, is of uncertain flow, and in dry seasons only stands in pools, or is found running under ground, making it necessary for the traveller or grazier to dig for water. There are numerous springs scattered about in the mountains which dot this area, but as they do not usually occur in the levels or mesas, it is somewhat difficult to reach them.

The mountains which traverse this territory run mostly in the same general direction as the river—that is so say, northwest and southeast. The most remarkable feature in the mountain system of this region, is that the elevations are mostly isolated, and have received the local designation of "Lone Mountains," so that a traveller passing from the Rio Bravo to the Pimo villages may, by deflecting slightly from a straight line, pass most of the way over a mesa, the different planes of which vary but slightly in elevation, and are usually from 3,000 to 4,000 feet above the sea.

It is that peculiarity which gives this territory a leading interest as affording a practicable passage for a national railway to the Pacific, and the facility of making a military road over easy gradients to unite the posts in the valley of the Rio Bravo with those on the Gila and in California.

These levels, although usually covered with a luxuriant growth of nutritious grasses, are mostly destitute of water; hence, the traveller is now obliged to seek his road over a more rugged surface in the mountains, where water is to be found. These levels, however, are the recipients of the drainage of the surrounding mountains, and water can be had by sinking wells at no great depth below the surface.

South of the Picacho de los Mimbres the Rio Mimbres, which is a large lively stream in the mountains, disappears entirely in its course to the south, in a large open plain, which presents to the eye of the distant observer the appearance of a meadow.

West as far as 112° meridian of longitude, the soil of the levels and hills is everywhere good, and, except in the playas, covered with a luxuriant growth of nutritious grass, mostly the grama.

The playas are large flats where water accumulates, and salts deleterious to vegetation are disengaged from the soil. They are not, however, very extensive, nor do they occur very often.

West of the 112th meridian, the soil becomes very sandy; the mountains of igneous rocks are bare of vegetation, and as we approach the Gulf of California, except in the immediate beds of the Gila and Colorado, the country becomes a hopeless desert—destitute alike of both water and vegetation—and from the best information I can collect, this is the character of the eastern coast of the Gulf of California as far down as the island of Tiburon, (almost to Mazatlan.) Of this particular section the memoir of Lieutenant Michler, which follows this, will give a more detailed description.

It is very possible the whole of the new territory, except the region of desert country referred to above, may be brought under the influence of artesian wells and made productive; but until that is the case, agriculture must be confined to the beds of the river, where the land is below the water-level. There are many tracts of this kind of surpassing richness, but of limited extent, on the Rio Bravo, on the Rio Gila, on the San Pedro, and on the Santa Cruz. Those which are most conspicuous, and which are at present in a very advanced state of cultivation, are the Mesilla Valley on the Rio Bravo, the Valleys of Tucson and Tomacacori on the Santa Cruz, and the settlement of the Pimos on the Gila river.

Throughout the whole course of the San Pedro there are beautiful valleys susceptible of irrigation, and capable of producing large crops of wheat, corn, cotton, and grapes; and there are on this river the remains of large settlements which have been destroyed by the hostile Indians, the most conspicuous of which are the mining town of San Pedro and the town of San Cruz Viejo. There are also to be found here, in the remains of spacious corrals, and in the numerous wild cattle and horses which still are seen in this country, the evidences of its immense capacity as a grazing country.

Removed from the river-beds, at the base of the mountains, where perpetual springs are found, are also to be seen the remains of large grazing establishments; the most famous of which is the ranch of San Bernardino, which falls half in the United States and half in Mexico. I have been informed that this establishment was owned in Mexico, and when in its most flourishing condition boasted as many as one hundred thousand head of cattle and horses. They have been killed or run off by the Indians, and the spacious buildings of adobe which accommodated the employés of this vast grazing farm are now washed nearly level with the earth.

Wherever water is sufficient, this whole region presents marvellous advantages for the raising of stock, owing to the character and quantity of the grass, the mildness of the winters, and its almost perfect exemption from flies and mosquitoes.

MINERAL WEALTH.

Retaining a vivid recollection of the constantly threatened desertion of our work in California, and the inconveniences which sometimes actually occurred, growing out of the gold mania which raged there in 1849, just as we were commencing to run the line, I kept the search for gold and other precious metals as much out of view as possible, scarcely allowing it to be the subject of conversation, much less of actual search; for I well knew if this mania was once to seize my party, it would be attended with the worst consequences; consequently, our investigations into the mineral wealth of the region have not been as thorough as they otherwise would have been.

Enough was ascertained, however, to convince us that the whole region was teeming with the precious metals. We everywhere saw the remains of mining operations, conducted by the

Spaniards, and more recently by the Mexicans. At this moment several companies from California are prospecting with success, and one company is working a mine in the Sierra del Ajo, west of Tucson. There are the remains of mines in the Mimbres mountains, rich in copper and gold; in the San Pedro mountains, between the San Pedro and Santa Cruz rivers, and on the Santa Cruz river a few miles north of the boundary, there are the remains of a mill for crushing gold quartz. These came under my own observation; and we had many reports of mines to the north, and invitations to visit them, which it was inconvenient to accept. We had what I consider authentic accounts of silver being found in *placers* in the Ajo mountains a little north of the line; although I have never before heard or read of silver being found in placers. I was informed upon authority which I could not permit myself to doubt, that a solid lump of virgin silver had been picked up in that region weighing eighteen ounces. Gold had been found in placers in the new territory in small quantities, in the Mimbres mountains, in the Chirricahui, and in the hills bordering the Santa Cruz river, between the boundary and the Calabasas ranch; and quite a rich placer is found in the mountains to the south of the line near Cocospera. Argentiferous galena, iron ore and meteoric iron are found in several localities. The analysis of Dr. Easter which is appended to this report will give the values of such of the metals as are collected.

I hope nothing I may say will induce persons to run off in unprofitable searches in these distant and unprotected regions. To guard against this it may be well to state, the country is now full of *prospecters* from California, who will undoubtedly discover anything worth knowing.

There are causes which must operate against the speedy development of the mineral wealth of this country, no matter how rich it may prove. One is the hostility of the Indians, which makes it unsafe for parties of less than fifteen or twenty to traverse the country; another is its remoteness from navigation and the scarcity of water.

There are within this territory four settlements; one the Mesilla Valley settlement, containing about fifteen hundred inhabitants of the mixed Spanish and Indian races, all engaged in the pursuit of agriculture.

At Tucson there is a settlement consisting of about seventy families, engaged in the same way. South of Tucson there is a small settlement at San Xavier of semi-civilized Indians, called Papagos; and further on, at Tomacacori, a small settlement of Germans.

San Xavier was once a Jesuit mission, and there remains in a very good state of preservation a large and handsome church.

The most considerable and interesting settlement in the new territory is composed of a confederacy of semi-civilized Indians, the Pimos and Coco Maricopas. Their population is variously estimated at from five to ten thousand. The military commandant at Santa Cruz estimated the number of warriors which they could muster at two thousand. They are located on the Gila river, and form the most efficient barrier for the people of Sonora against the incursions of the savages who inhabit the mountains to the north of the Gila, and who sometimes extend their incursions as far south as Hermosilla, in the State of Sonora.

I became acquainted with these people in 1846, and in another work eulogized their advanced state of civilization, their proficiency in agriculture and the art of war, and their morality. While at Los Nogales, our last astronomical station near the 111th meridian of longitude, a delegation, consisting of the chiefs and head-men, visited my camp, nearly two hundred miles distant from their homes, to consult as to the effect upon them and their interests of the treaty with Mexico, by which they were transferred to the jurisdiction of the United States. I give below a copy of the statement made at the meeting, where it will be seen I said all in my power

to silence their apprehensions. They have undoubtedly a just claim to their lands, and if dispossessed will make a war on the frontier of a very serious character.

I hope the subject will soon attract the attention of Congress, as it has done that of the Executive, and that some legislation will be effected securing these people in their rights. They have always been kind and hospitable to emigrants passing from the old United States to California, supplying them freely, and at moderate prices, with wheat, corn, melons, and cotton blankets of their own manufacture.

CAMP AT LOS NOGALES, *June* 29, 1855.

Capt. Antonio Azul, head chief of the Pimos; Capt. Francisco Luke, Coco Maricopa chief; Capt. Malai, Coco Maricopa chief; Capt. Shalan, a chief of Gila Pimos; Capt. Ojo de Burro, war-chief of Pimos; Capt. Tabaquero, a chief of Gila Pimos; Capt. La Boca de Queja, a chief of Gila Pimos; Capt. José Victoriano Lucas, head chief of San Xavier Pimos; Capt. José Antonio, chief of San Xavier Pimos, have this day visited my camp for the purpose of ascertaining in what manner the cession of the territory, under the treaty with Mexico, will affect their rights and interests. I have informed them that, by the terms of the treaty, all the rights that they possessed under Mexico are guarantied to them by the United States; a title to lands that was good under the Mexican government is good under the United States government. I informed them that, in the course of five or ten months, perhaps sooner, the authorities of the United States would come into the ceded territory and relieve the Mexican authorities; until that time, they must obey the Mexican authorities, and co-operate with them, as they have done heretofore, in defending the territory against the savage Apaches.

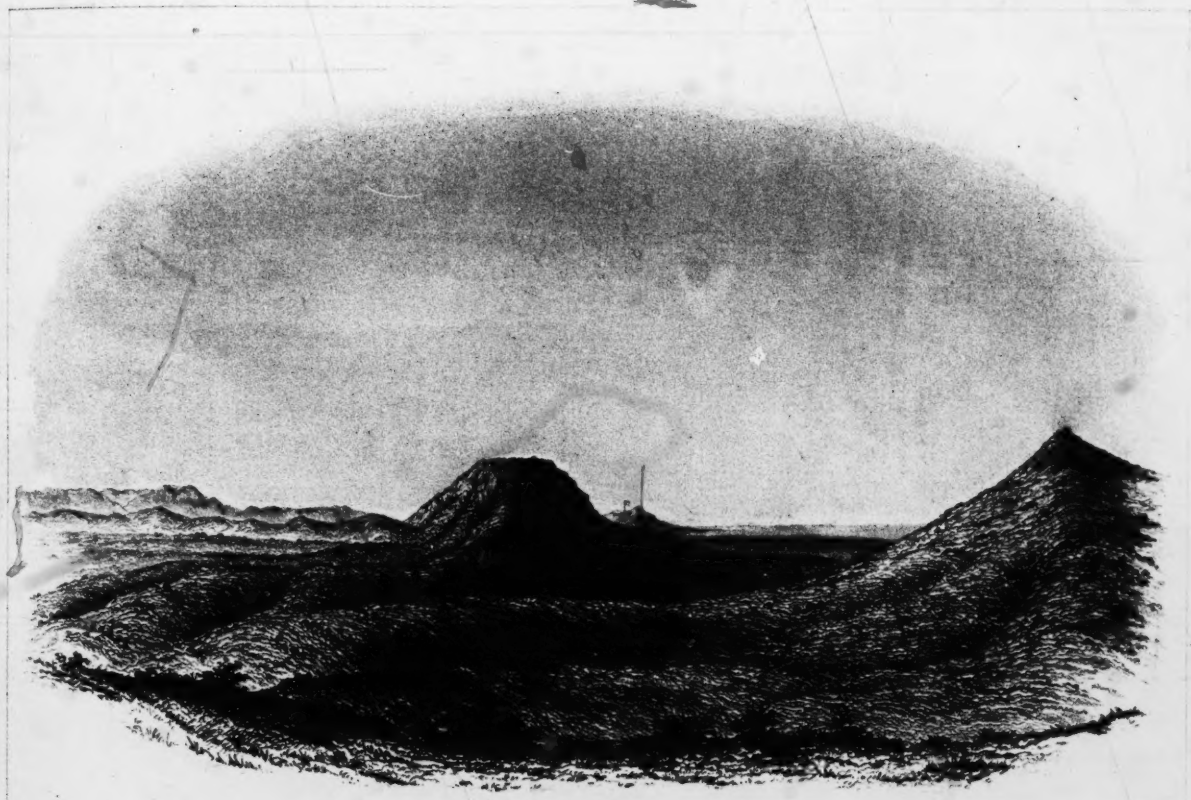
I have examined the testimonials given by numerous American emigrants to Azul and his captains, bearing testimony to the kindness and hospitality of himself, and the Pimo and Coco Maricopa Indians generally. I can myself bear testimony to the truth of these statements. I therefore call upon all good American citizens to respect the authority of Azul and his chiefs.

W. H. EMORY,
U. S. Commissioner, Major U. S. A.

ANTONIO AZUL,	*alias*	CHE-T-A-CA-MOOSE.
FRANCISCO LUKE,	"	SEE-COOL-MAT-HAIS.
MALAI.		
SHALAN,	"	KI-MAS.
OJO DE BURRO,	"	WAH-LA-WHOOP-KA.
TABAQUERO,	"	VIR-AH-KA-TA.
LA BOCA DE QUEJA,	"	KI-HO-CHIN-KO.
JOSÉ VICTORIANO LUCAS.		
JOSÉ ANTONIO.		

I furnished the head-chief a copy of this paper and gave him for distribution among his subalterns, some silver dollars, and all the blankets and cloths which could be spared from our camp.

I conclude this chapter by giving a series of views along the line, sketched by Mr. John E. Weyss. These views commence at the point where the boundary line leaves the Rio Bravo, and terminate at the 111th meridian of longitude. They were taken to perpetuate the evidences of the location of the boundary, in the event of the Indians removing the monuments erected on the ground. They give also a very good idea of the topography of the country.



VIEW OF MONUMENT MOUNTAIN

NOTES TO ACCOMPANY SKETCHES, (VIEWS ALONG THE BOUNDARY LINE ON PARALLEL 31° 47′ AND 31° 20′ NORTH LATITUDE), BY JOHN E. WEYSS, FROM STARTING POINT ON THE RIO BRAVO TO 111TH MERIDIAN OF LONGITUDE.

Sketch No. 1 presents a view of the initial point on the Rio Grande, the observer looking west along the line, parallel 31° 47′ N. The flag indicates the point where the line crosses the mountain known as the "Muleras." Directly west of this mountain, the line crosses a very sandy valley, supposed to be a former bed of the Rio Grande, and strikes the table land (some 200 feet above the river) about three miles from the initial point. Here sketches Nos. 2 and 3 were taken, looking respectively east and west.

Sketch No. 2 is a back view, looking towards the initial point, again showing where the line crosses the Muleras mountain, and also, in the back-ground, the mountains near Franklin, east of the river.

Sketch No. 3 is a view taken at the same point as No. 2; that is, where the line first strikes the table-land, but in the direction of the line westward. The line here leads over an apparently endless level table-land, which is very sandy and generally without grass, but thickly covered with clumps of bushes and small sand-hills four or five feet high. On the horizon, exactly in the line, is visible the top of an isolated mountain, serving beautifully as a natural monument. The mountains seen on the right hand are the "Sierra del Potrillo."

Sketch No. 4 is taken from the top of the isolated mountain that the line strikes, as represented in sketch No. 3. By this view, the observer looks east along the line towards the initial point. The volcanic mountain range on the left of the flag is called "Sierra Seca." The two mountains behind this Sierra are the topmost peaks of the Sierra del Potrillo, represented in sketch No. 3. The Sierra, quite on the back-ground, shows the mountains near Franklin, and those on the right of the flag are the mountains near El Paso.

Sketch No. 5 is a near view of the Monument mountain before mentioned, on which is shown, by the flag, the exact point struck by the boundary line. This view was taken from a point west of this mountain, and about a mile from it.

Sketch No. 6 is a view also taken near, and from the west side of Monument mountain, but looking westward along the line. At this mountain the table-land ceases, and the line passes over a series of hills for about 2.5 miles, the highest of which is not more than 300 feet, with so gentle an ascent as to be easily crossed with loaded wagons. Passing these hills, the line leads into a broad valley, bounded on the west by the Sierra del Carrizalillo. About a mile from the foot of these hills the sand begins to disappear, and fertile soil takes its place. The pasturage of this valley was everywhere luxuriant; and in its lowest part, nearly midway between Monument mountain and the Sierra del Carrizalillo, about one mile south of the boundary line, are the "ojos adjuntos," the first permanent water near the line west of the Rio Grande, and about sixty-four miles from the initial point. The "ojos adjuntos" are a series of lagoons formed by many springs, of which fifteen were counted, all affording clear water. They are connected, and all together present a sheet of water from one and a half to two miles long, by from one-third to one-half mile broad, and four to five feet deep; their direction is north and south. The most northern springs, as also the lagoons which they form, are some four or five feet higher than the surrounding prairie. It is possible that these springs are but the re-appearance of the Rio Mimbres. Fine grama grass surround these lagoons and springs, but no bushes. From the "ojos adjuntos" to

the foot of the Carrizalillo hills, there is a gentle ascent of the prairie. In the prolongation of the line towards this last named Sierra, it passes six miles south of the "Sierra del Tabaco," and north of, but very near, two small isolated hills, where the magnetic needle underwent a variation of 2° 30′; the needle was affected by this magnetic influence at the distance of three miles, on each side of these hills. The mountains on the left of the flag in this view, are the Sierra de la Boca Grande; those directly on the back-ground, the Sierra del Carrizalillo, where the line crosses; and those on the right hand belong to the Sierra del Tabaco.

Sketch No. 7 gives a view of the Carrizalillo hills where they are crossed by the line. It leads up a steep valley across these hills, through an open valley, into another series of hills, where the parallel 31° 47′ terminates. This termination is marked by a monument, a view of which is given in sketch No. 8.

Sketch No. 8.—From this point southward the meridians connecting the parallels 31° 47′ and 31° 20′ constitute the boundary line. This sketch gives a view westward, from the terminal point of line on parallel 31° 47′, and not along the line.

Sketch No. 9 represents a view of the line, on the meridian, from the monument marking the terminal point on parallel 31° 47′. The flag marks the direction across the hills.

Sketch No. 10 is taken from the point where the flag stands in sketch No. 9. This view is south along the meridian. The high mountains on the left are the Sierra de la Boca Grande. The distant hill ranges beyond the plain, and covered by the flag are the hills on which is erected the monument marking the beginning of the boundary on parallel 31° 20′. The hills on the right hand belong to those adjoining "Ojo del Perro." The boundary line here runs through a large valley or plain; the Sierra de la Boca Grande lying on the east, and the Sierra de la Hacha, and that of Ojo del Perro, on the west. Nearly in the middle of this valley, and about 172 miles east of the boundary line, are situated the Ojos de los Mosquitos, five in number, which, though furnishing an abundant supply of clear water, soon sink below the surface. The pasturage of this valley is good in some places; but the soil is generally sandy, and many spots are destitute of vegetation. As the mountains are approached, the soil becomes gravelly and bushes abound.

Sketch No. 11 presents a view of the hills on which is located the monument marking the initial point of the line on parallel 31° 20′. The view looks south along the meridian, and the flag marks the spot where the monument is erected.

Sketch No. 12 is a back view from the monument, looking north along the meridian. The rocky bluffs on the left are a part of the mountains near Ojo del Perro. Further on, and in the middle ground, are seen the Sierra de la Hacha, and entirely in the back-ground appear the hill ranges on which terminates the line on parallel 31° 47′.

Sketch No. 13 is taken from the same point as No. 12, but looks west along the parallel 31° 20′. All the hills here represented belong to the Sierra del Ojo del Perro. The spring giving name to the sierra is situated at the foot of the second mountain on the right of the flag, and is about seven miles west of the monument, and north of the flag one and a half.

Sketch No. 14 is a view taken from the place marked by the flag in sketch No. 13, looking eastward. The range behind the flag embraces the hill on which is located the monument, as shown in sketch No. 13. The mountain range in the back-ground on the left is Sierra de la Boca Grande. From this flag westward the boundary line runs for a few miles over a series of round hills, and, after crossing a wide valley, strikes the high Sierra de San Luis. The soil of this valley is light and sandy, except in the middle it is covered with grass and other vegetation.

It contains a large prairie-dog town, and, constituting the receptacle of an extensive drainage, would be passed with much difficulty during the rainy season. A series of springs were discovered near the middle of the valley, and about one mile south of the line. They form a little creek, but are lost in the sand in a run of less than two miles.

Sketch No. 15.—A near view of the San Luis mountains where they are crossed by the line; sketched from the intersection of the line and the road leading from Janos to Santa Cruz.

Sketch No. 16.—This view is sketched from the monument near San Luis springs, looking eastward. The flag shows where the line crosses the mountain.

Sketch No. 17 is taken from the same point as No. 16, but in the opposite direction. The top of the mountain on the back-ground, directly over the monument, is the first over which the line runs near the Guadalupe Pass.

Sketch No. 18 is a near view of the mountain whose top rests on the horizon in sketch No. 17. The flag indicates where it is struck by the line.

Sketch No. 19 looks west along the line, and is taken from the point marked by the flag in No. 18.

Sketch No. 20 is drawn from the point indicated by flag in No. 19. It looks westward, and the single peak in the back-ground belongs to the mountain ridge west of San Bernardino; and the sierras still further off are the San José and Espinola, on the left and right, respectively.

Sketch No. 21 is a view looking eastward from the point where the line crosses the road through the Guadalupe Pass.

Sketch No. 22 is a view from the monument near the springs of San Bernardino, looking west along the boundary, and giving a nearer view of the peak seen from the Guadalupe cañon, and represented in sketch No. 20.

Sketch No. 23.—A back view taken from the same point as No. 22, but looking eastward towards the Guadalupe cañon.

Sketch No. 24.—In this the observer again looks west, and is shown where the line crosses the first mountain-ridge west of San Bernardino. The mountain on the left of the flag is the peak referred to in sketches Nos. 20 and 22.

Sketch No. 25.—This view is sketched from the point indicated by the flag in Sketch No. 24. The high mountain on the left fore-ground represents the before-mentioned peak. The high sierra in the back-ground on the flag is the San José; that on the right the Sierra de Espinola. Rain-water was found at the foot of the hill where the flag stands, and was the only water near the line between San Bernardino and Rio San Pedro, a distance of fifty-five miles. The Rio San Pedro flows along the eastern base of the Sierra de Espinola.

Sketch No. 26 is a view taken at the foot of the hill on which the flag stands in sketch No. 25; it looks west along the parallel. From this hill, as far as the banks of the Rio San Pedro, the line runs over a rolling prairie of a light, sandy soil, sometimes covered with bushes, sometimes bare, and fine patches of pasturage occurring here and there.

Sketch No. 27.—View looking west along the line from from flag-staff in sketch No. 26.

Sketch No. 28.—Sketched from flag in view No. 27, also looking westward. The mountains on the left edge of which the flag rests, and marks the line, are the Sierra de Espinola.

Sketch No. 29.—This view looks westward, and is taken on the east bank of the Rio San Pedro, where it is crossed by the line. At this point, approaching from the east, the traveller

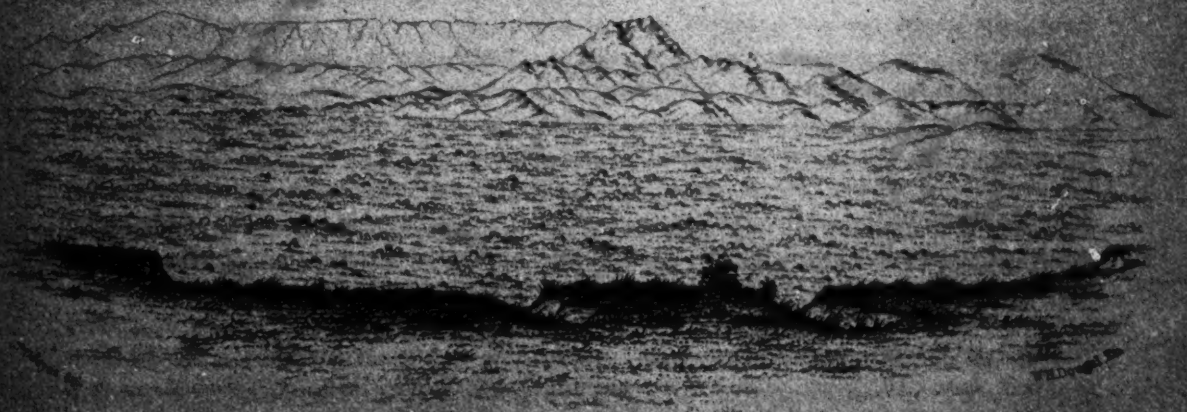
comes within a mile of the river before any indications of a stream are apparent. Its bed is marked by trees and bushes, but it is some sixty or one hundred feet below the prairie, and the descent is made by a succession of terraces. Though affording no very great quantity of water, this river is backed up into a series of large pools by beaver-dams, and is full of fishes. West of the river there are no steep banks or terraces, the prairie presenting a gentle ascent. Here again the flag represents where the line touches the Sierra de Éspinola. The mountains in the back-ground on the left of the flag are directly east of Santa Cruz.

Sketch No. 30 is taken from the monument situated north of Santa Cruz, and is a back view, showing the flag on Sierra de Éspinola.

Sketch No. 31.—A view from the same monument, but looking westward. The mountains in the right-hand corner of the back-ground are the Santa Rita.

Sketch No. 32.—This is a view near Los Nogales, and shows where the line crosses the road leading from Tucson to Imuris. It looks south from the monument. The mountains in the back-ground are called the Sierra del Pajarito.

VIEW OF THE INITIAL POINT OF THE BOUNDARY LINE ON THE RIO BRAVO DEL NORTE - LOOKING WEST



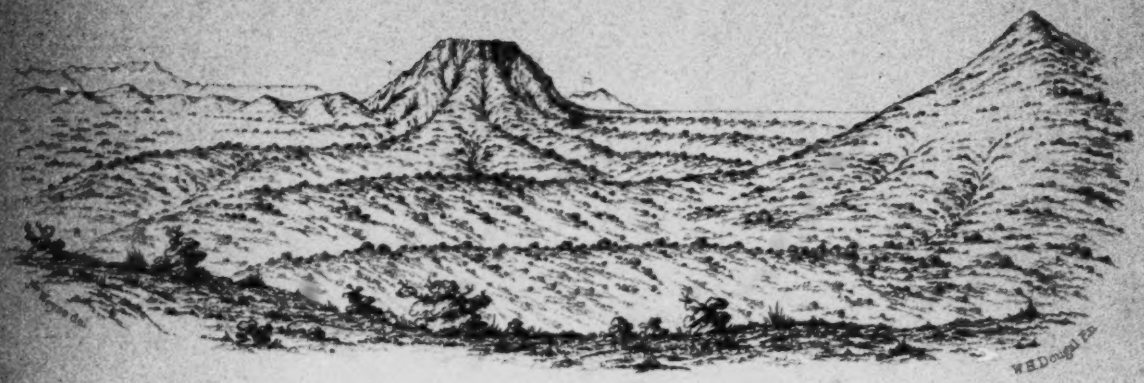
VIEW ALONG THE BOUNDARY LINE, LOOKING EAST FROM MONUMENT No. 2 ON PARALLEL 32°

3

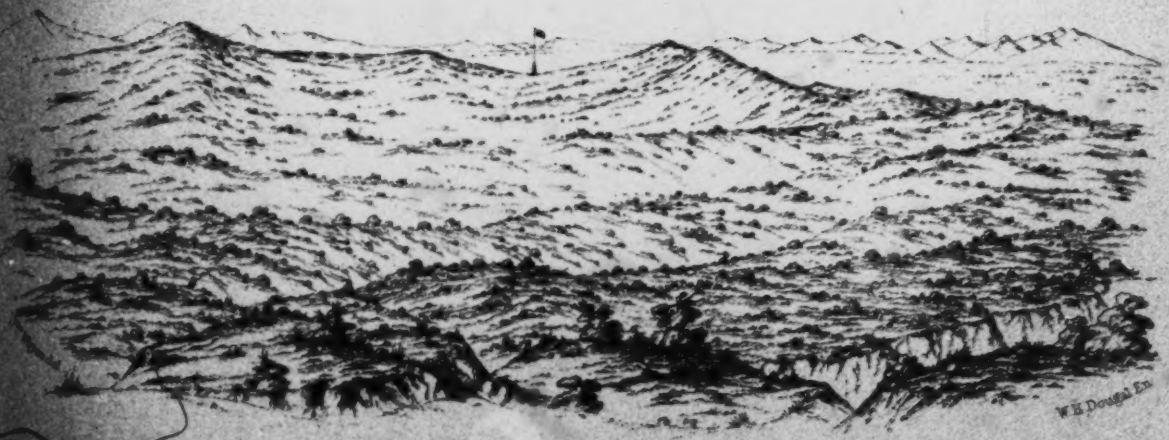
VIEW FROM MONUMENT N° 3 - LOOKING WEST ALONG THE PARALLEL OF 31°-47'

4

VIEW FROM MONUMENT N° 4 - LOOKING EAST ALONG THE PARALLEL OF 31°-47'



VIEW FROM MONUMENT N°8-LOOKING EAST ALONG THE PARALLEL OF 31° 47'



VIEW FROM MONUMENT N°9-LOOKING WEST ALONG THE PARALLEL OF 31° 47'

VIEW OF THE CARRIZALILLO HILLS WHERE CROSSED BY THE BOUNDY LINE ON PARALLEL 31° 47' – LOOKING WEST

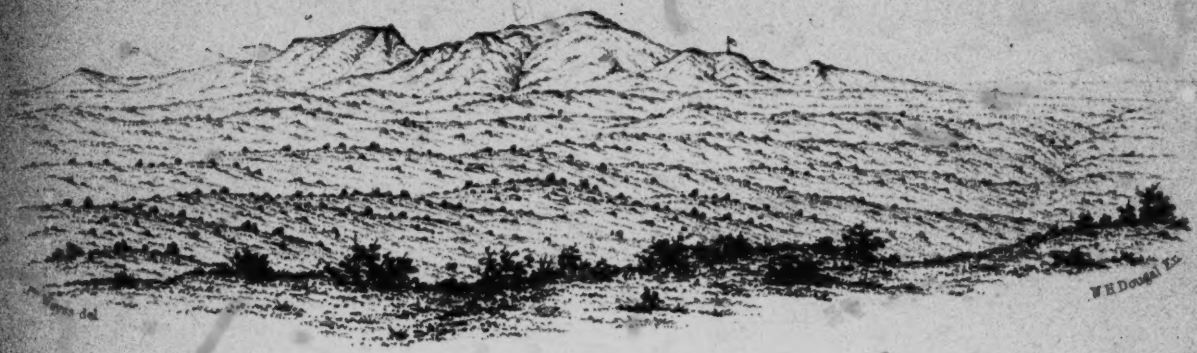
VIEW FROM THE MONUMENT MARKING THE TERMINAL POINT OF BOUNDARY ON PARALLEL 31° 47' – LOOKING WEST
[not along the Boundary]

VIEW FROM THE MONUMENT MARKING THE TERMINAL POINT OF BOUNDARY ON PARALLEL 31° 47' LOOKING SOUTH ALONG THE MERIDIAN

[from flag on above sketch]

DISTANT VIEW OF THE HILLS ON WHICH IS LOCATED THE MONUMENT MARKING THE INITIAL POINT OF THE BOUNDARY LINE ON PARALLEL 31° 20' LOOKING SOUTH ALONG THE MERIDIAN

11



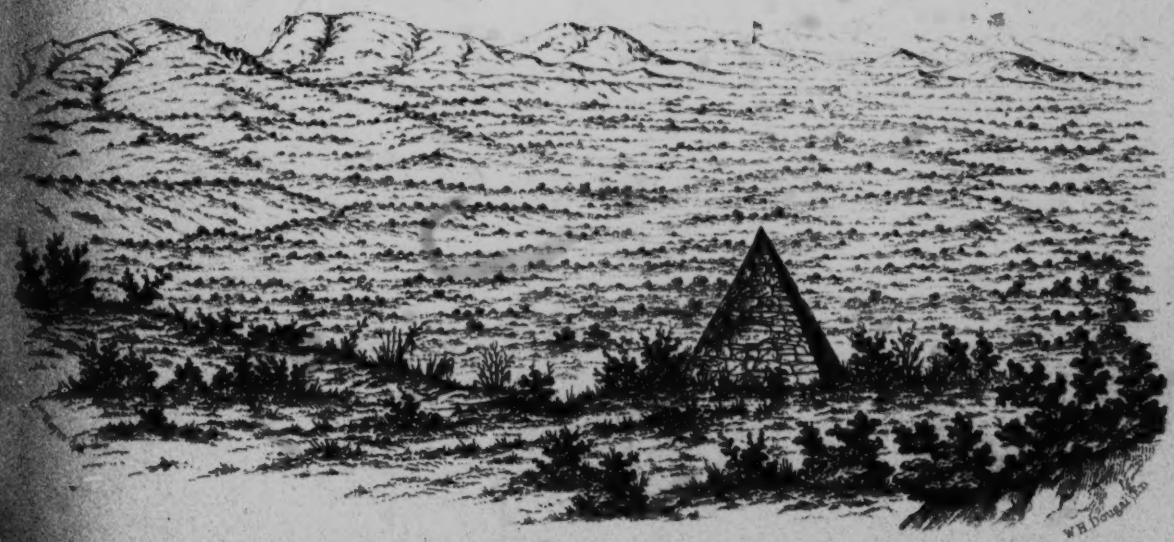
NEAR VIEW OF THE INITIAL POINT OF THE BOUNDARY LINE ON PARALLEL 31°20 LOOKING SOUTH ALONG THE MERIDIAN

12

VIEW FROM INITIAL POINT OF BOUNDARY LINE ON PARALLEL 31° 20 LOOKING NORTH ALONG THE MERIDIAN

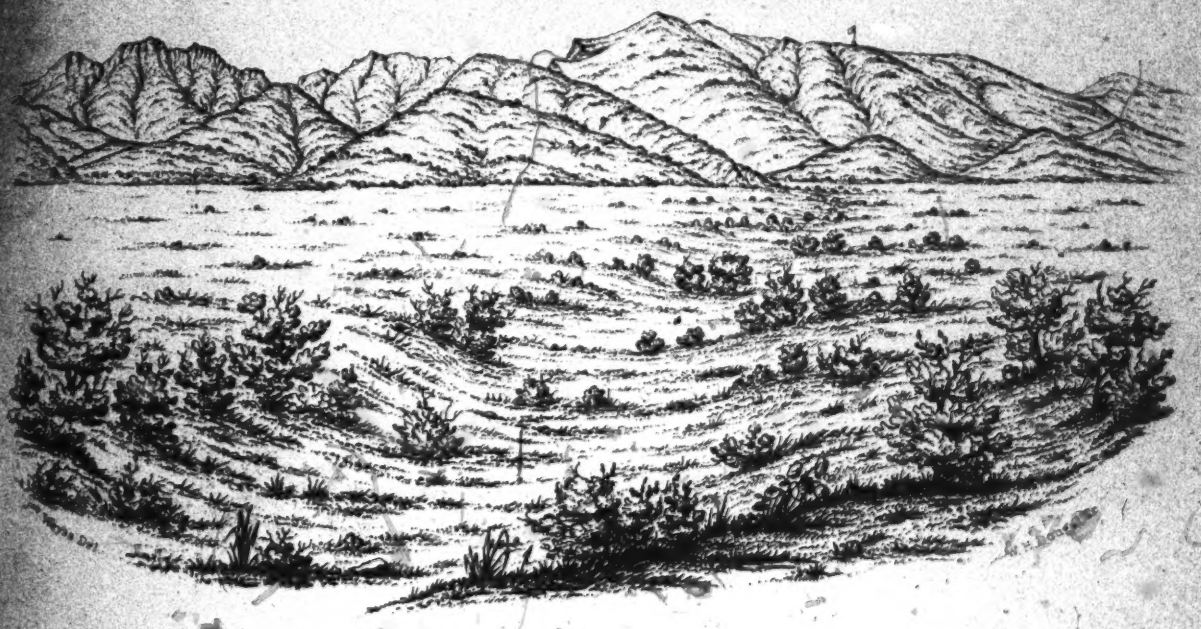
VIEW FROM HILL RANGE REFERRED TO IN N°13 BACK TO INTERSECTION

13



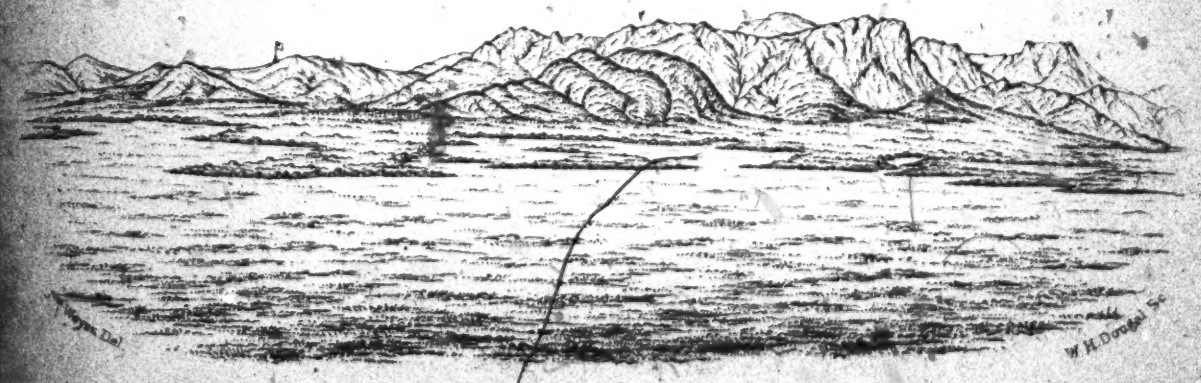
VIEW FROM INTERSECTION OF MERIDIAN AND PARALLEL OF 30°20' LOOKING WEST ALONG THE PARALLEL TO THE FIRST RANGE OF HILLS

15



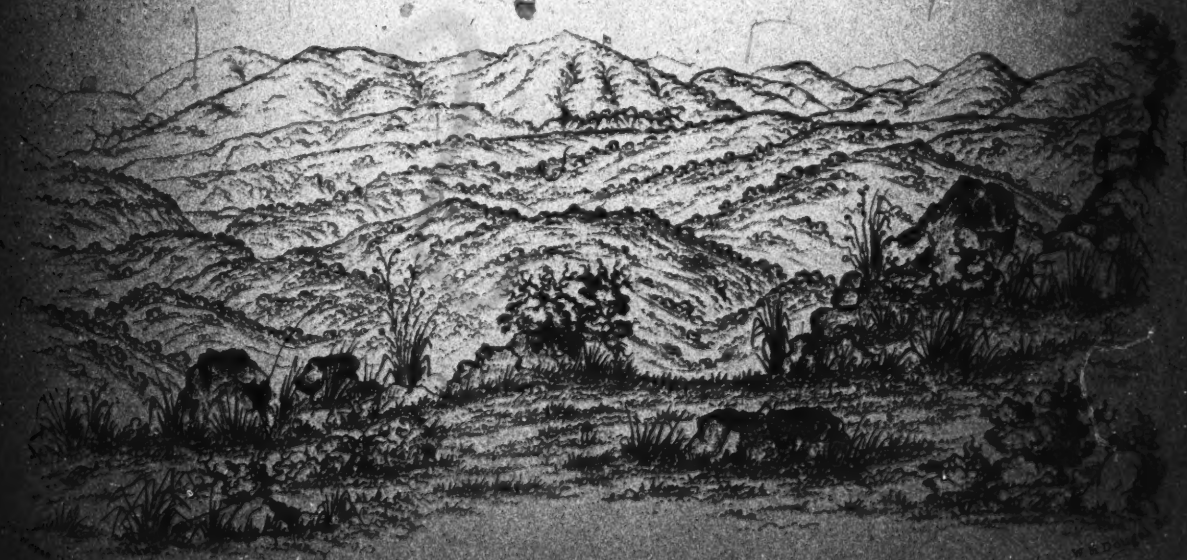
VIEW ALONG PARALLEL 31° 20' FROM MONUMENT ON THE JANOS ROAD TO THE POINT WHERE THE LINE CROSSES St LOUIS Mts

16



VIEW FROM EMORY'S MONUMENT SOUTH OF St LUIS SPRINGS BACK TO THE SAME POINT ON THE MOUNTAINS

VIEW FROM EMORY'S MONUMENT SOUTH OF THE SAN LUIS SPRINGS LOOKING WEST ALONG THE PARALLEL OF 31°20'



VIEW LOOKING WEST OF THE POINT WHERE THE PARALLEL OF 31°20 FIRST STRIKES THE GUADELUPE CAÑON

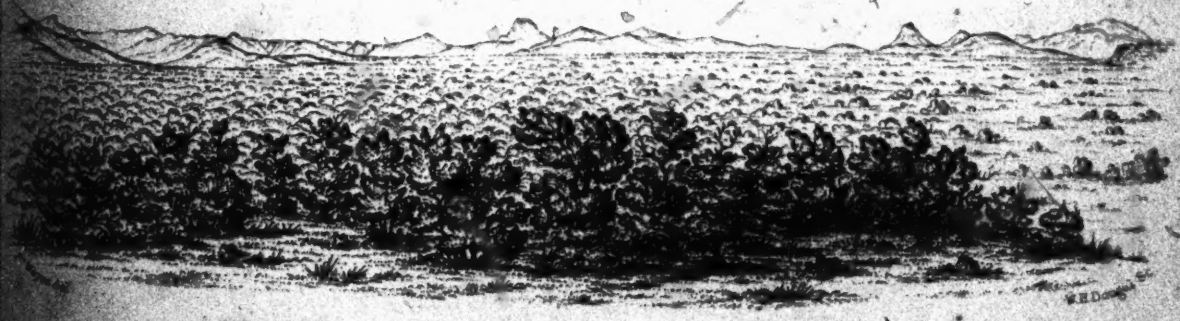
FIRST VIEW OF THE GUADALUPE CANON ALONG THE BOUNDARY LINE ON PARALLEL 31° 20'-LOOKING WEST

SECOND VIEW OF THE GUADALUPE CANON ALONG THE BOUNDARY LINE ON PARALLEL 31° 20'-LOOKING WEST

21

VIEW OF THE POINT WHERE THE LINE CROSSES THE ROAD IN THE GUADALUPE CANON - LOOKING EAST ALONG THE PARALLEL 31° 20'

22



VIEW FROM EMORY'S MONUMENT AT THE SAN BERNARDINO SPRINGS - LOOKING WEST ALONG THE PARALLEL OF 31° 20'

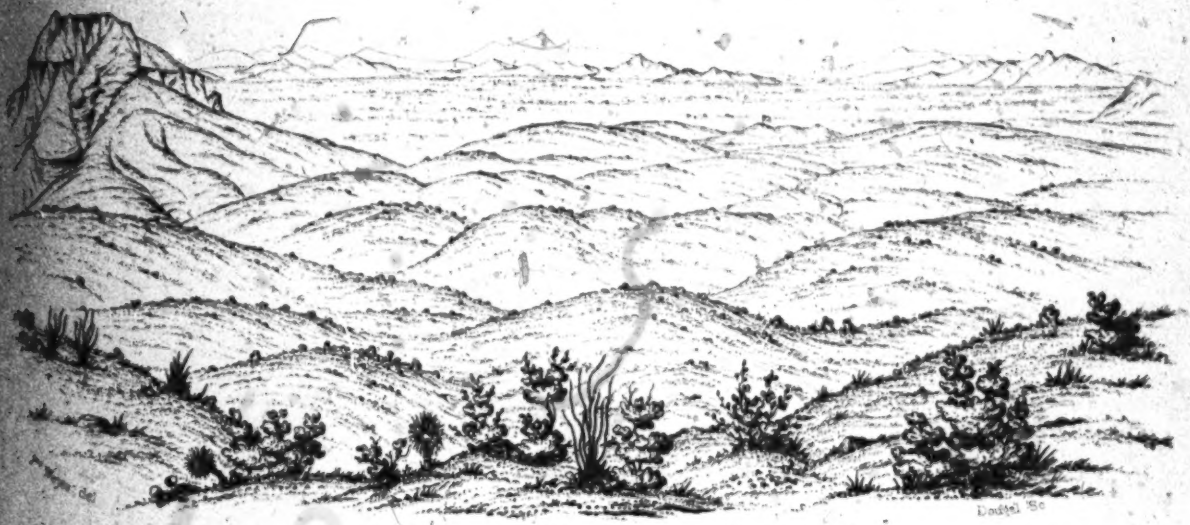
23

VIEW FROM EMORY'S MONUMENT AT THE SAN BERNARDINO SPRINGS - LOOKING EAST ALONG THE PARALLEL OF 34° 20'

24

VIEW ALONG THE LINE 34° 20' LOOKING WEST WHERE IT CROSSES THE FIRST RANGE OF HILLS WEST OF SAN BERNARDINO

25

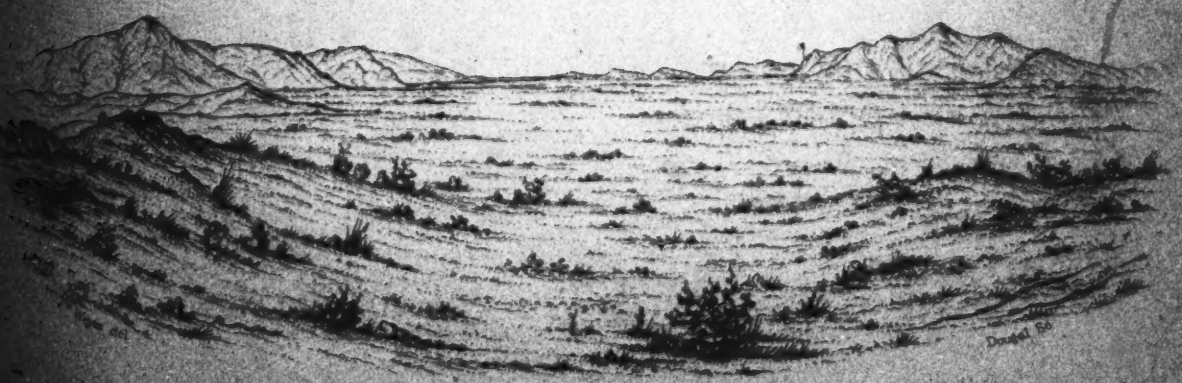


VIEW FROM THE MONUMENT NEAR SAN BERNARDINO LOOKING WEST, ALONG THE PARALLEL 35° 20'

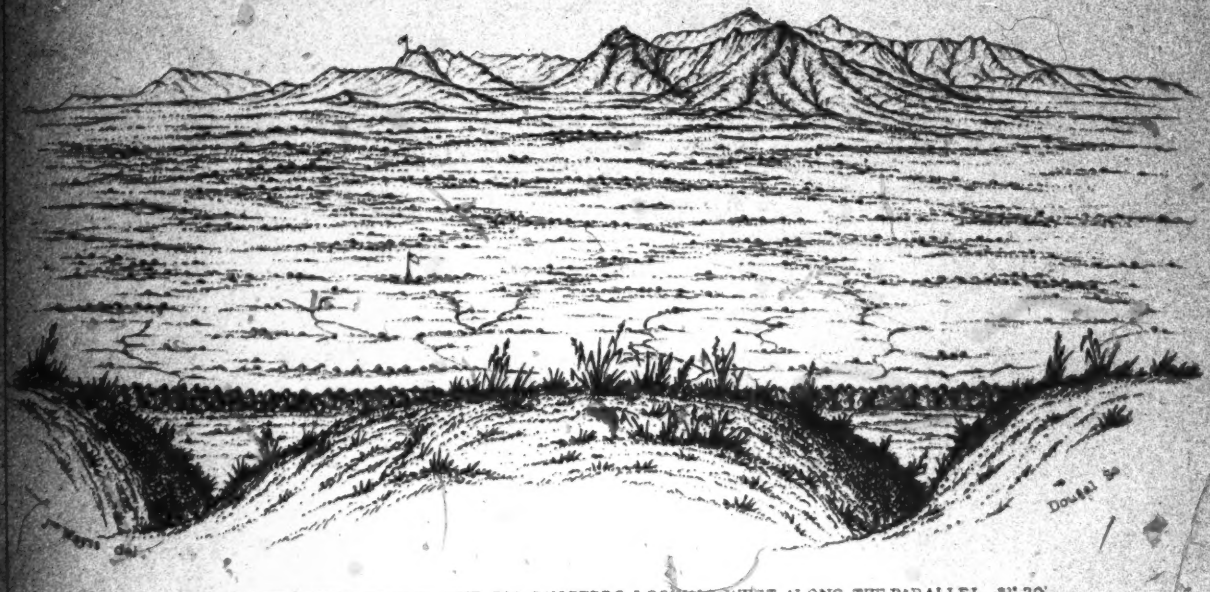
26

VIEW ON THE PRAIRIE BETWEEN SAN BERNARDINO AND THE SAN PEDRO, LOOKING WEST ALONG THE PARALLEL 35° 20' (Nº 1)

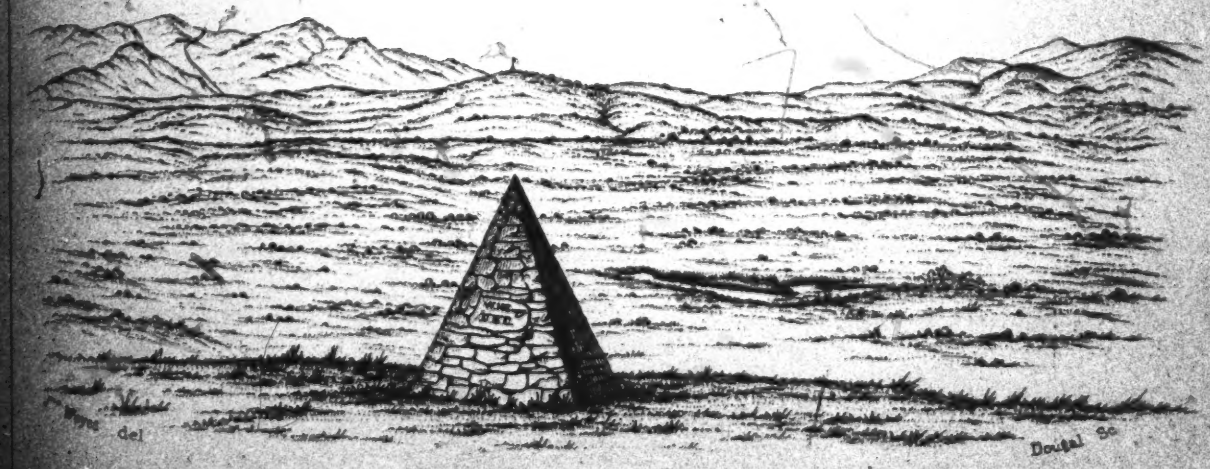
VIEW ON THE PRAIRIE BETWEEN SAN BERNARDINO AND THE SAN PEDRO, LOOKING WEST
ALONG THE PARALLEL 31° 20' (Nº 2)



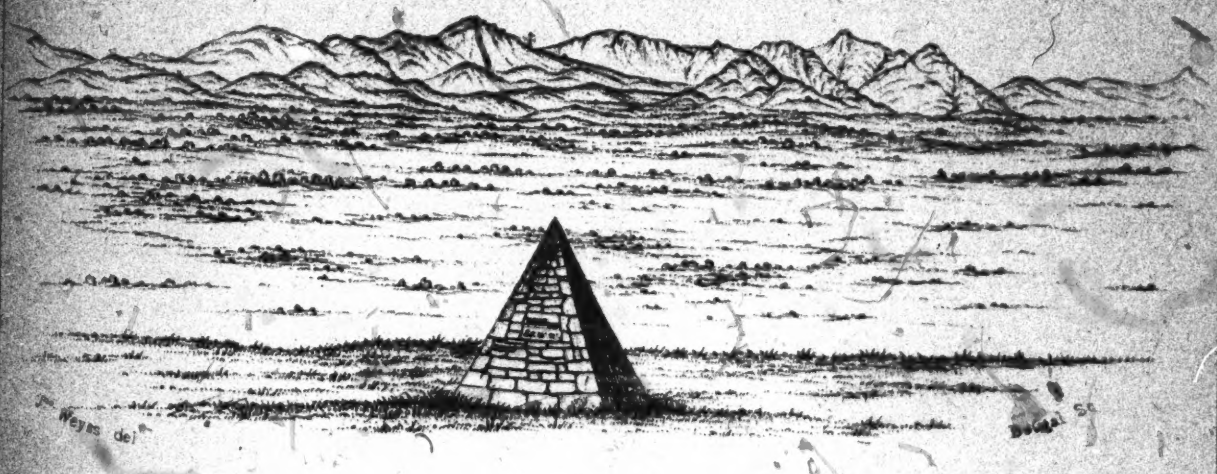
VIEW ON THE PRAIRIE BETWEEN SAN BERNARDINO AND THE SAN PEDRO, LOOKING WEST
ALONG THE PARALLEL 31° 20' (Nº 3)



VIEW FROM THE MONUMENT ON THE RIO SAN PEDRO, LOOKING WEST ALONG THE PARALLEL 31° 20'



VIEW FROM EMORYS MONUMENT NORTH OF SANTA CRUZ, LOOKING EAST ALONG THE PARALLEL 31° 20'



VIEW FROM EMORYS MONUMENT NORTH OF SANTA CRUZ. LOOKING WEST ALONG THE PARALLEL 31°20'

VIEW FROM THE MONUMENT NEAR LOS NOGALES. LOOKING SOUTH
(not along the line)

CHAPTER VII.

CHAPTER VII.

FROM THE 111TH MERIDIAN OF LONGITUDE TO THE PACIFIC OCEAN.

REPORT OF LIEUT. MICHLER.

FORT YUMA.—COLORADO AND GILA.—SLOUGHS OR ARROYOS.—SITE OF AN OLD PRESIDIO.—BOUNDARY LINE.—SAND BELT.—DESERT.—PANORAMA OF MOUNTAIN RANGES.—MIRAGE.—BOTTOM LAND AND VEGETATION.—EARTHQUAKES AND MUD VOLCANOES.—CLIMATE.—DUST STORMS.—INDIANS.—INITIAL POINT ON THE COLORADO.—TINAJAS ALTAS.—TULE.—SALADO.—AGUA DULCE.—QUITOBAQUITA.—CABEZA PRIETA.—SONOYTA.—ROAD ALONG THE GILA.—MARICOPAS.—PIMOS.—TUCSON.—SAN JAVIER.—TUBAC.—TOMOCACORI.—SOPORI.—ARIBACA.—SIERRAS ALONG THE AZIMUTH LINE.—PAPAGOS.—"TIERRA CALIENTE" OF SONORA.—SANTA MONICA.—SANTA ISABEL.—HEIGHT AND ABRUPTNESS OF MOUNTAIN RIDGES.—EASTERN SLOPE.—COLORADO DESERT.—NEW RIVER.—DISTANCES.

OFFICE UNITED STATES AND MEXICAN BOUNDARY SURVEY,
Washington, July 29, 1856.

SIR: The following extract is taken from your orders to me, dated Washington, D. C., August 29, 1854: "You are charged with the important service of running that part of the boundary line between the United States and Mexico which commences on the Colorado river, twenty English miles below or south of the junction of that river and the Gila, until you meet the party running the line under my immediate direction, from El Paso westward."

Having complied with your instructions, I now have the honor to submit to you a report of the manner in which the work has been executed, and describe that portion of the country to which our duty particularly confined us, and the Indian tribes frequenting the immediate neighborhood of the line.

Sailing from New York on September 20, 1854, myself and assistants proceeded, via Aspinwall, Panama and San Francisco, to San Diego. All necessary instruments having been provided before leaving the eastern cities, preparations for the transportation, subsistence, and organization of a party occupied my attention in the last named places. These completed, we left San Diego on the 16th of November, for Fort Yuma, which place was reached, after journeying over mountains and deserts, on the 9th of December. This road, the most difficult I have ever travelled for heavily-loaded wagons, has been already spoken of in your military reconnoissances in New Mexico and California, and a further description would be unnecessary. Its distance, measured with a viameter, is 217 miles.

On the right bank of the Colorado, and in a bend opposite the mouth of the Gila, rises up a low irregular hill, from seventy to eighty feet in height; on the water-side there is a perpendicular cliff; the other sides are less steep, but equally rugged. This hill is of Plutonic origin, and presents a bleak, dreary appearance. The surface is covered with sharp, volcanic rocks, cutting like glass under the tread, and is destitute of every form of vegetation, except the euphorbia, a rank poison, and used by the Indians as an antidote against the bite of the rattlesnake. Such is the site of the military post of Fort Yuma. This hill, cleft by the Colorado at

its junction with the Gila, and extending a short distance, unites with a larger mass of the same formation. A mile further south is another isolated hill, about 250 feet high, called Sierra Prieta, with its base imbedded in the white sands of the desert. These hills were once one and the same; one river runnning around its north, and the other its south base, (their old beds being still traceable,) and both uniting on the west. By some freak in the laws of nature, an eruption in the bowels of the earth caused an upheaving of this whole section of country, and changed the beds of these rivers: the one now runs due south, and the other due north, before uniting. Their currents act on the same line and are diametrically opposed, and as the waters meet, neither willing to yield, they open a passage through the highest part of the hill, turning at right angles to their original courses and flowing towards the west. The cleft thus made is about 240 feet in width. The Colorado furnishes more than two-thirds of the water. At an average stage at the junction, the quantity discharged per second was found, from a mean of several experiments, to be 6,249 cubic feet, and the velocity three feet per second. At the same point the depth of the channel is about eighteen feet. It then widens, and becomes more shallow. By daily observations with the barometer, the level of the rivers at their confluence was found to be 275 feet above that of the sea at San Diego. The Colorado, as its name signifies, is of a reddish color, and carries down immense quantities of sand and mud. The water is sweet, and excellent for drinking, but does not bear keeping long, as it soon putrifies. The Gila is clearer, and its temperature warmer, but somewhat brackish in its taste, owing to the large quantity of earthy salts held in solution.

For twenty miles above the post the Colorado spreads out into a wide and low sheet of water; but above that point, to the entrance of the Great Cañon, it becomes more narrow and deep. An expedition under Major Heintzelman ascended this river in boats in September, 1852. Another is contemplated, when it is the purpose to carry a steamboat up as far as possible, provided the government will render some assistance by an appropriation sufficiently large to insure the safety of the boat. The belief is entertained and strongly advocated, that the Colorado will be the means of supplying the Mormon territory, instead of the great extent of land transportation now used for that purpose. Its head-waters approach the large settlements in Utah, and may one day become the means of bearing away the produce and stock of these pioneers of the far West. With this idea prominent in the minds of speculators, a city on paper, bearing the name of "Colorado City," has already been surveyed, the streets and blocks marked out, and many of them sold. It is situated on the left bank, opposite Fort Yuma.

From the description given me of the Great Cañon, it must resemble in appearance and character those along the Rio Bravo del Norte, upon which I have already reported.

The Colorado is said to have but few tributaries; the Gila has several, emptying in above and below the Pimos villages. The annual rise in both rivers usually takes place in the months of May and June, sometimes as late as July, and is caused by the melting of the snows in the mountains near their head-waters; the freshets are not of long duration. Frequently the one stream will be up and the other down. The Gila becomes so low that a sand-bar forms at its mouth during the summer, and at no time does it supply much water. The Colorado, on the contrary, is navigable for small steamers, drawing two and two and a half feet water, as high up as Fort Yuma. Sailing-vessels take stores from the Pacific through the Gulf of California, and up the river, sixty miles above its mouth, to Point Invincible, or near Hardy's Colorado, and there discharge their cargoes upon the river steamers; the latter then transport them ninety miles to the junction—the present contract price per ton being seventy-five dollars, and

the boat carrying from fifty to sixty tons. This is a great saving, as the cost of transportation of stores by trains across the desert is enormous. The navigation is pretty good, but, like all streams of the same nature, the channel frequently changes, owing to the shifting sands and the instability of its banks. The nature of the latter varies; thirty miles above the junction, the river is walled in by mountains throughout nearly its whole extent; and fifteen miles lower down, it passes for a short distance through the Santa Isabel range. From there to the salt marshes near the mouth, except at the junction with the Gila, the banks are alluvial, caving in and shifting with every rise and fall; they become very low and flat, and are overflowed for miles during spring tides; a heavy *bore* then rushes in, swell upon swell, and renders it very dangerous for small boats. The tides ascend for thirty-seven miles. The lowest depth of the channel is three feet, its mean or average stage of water six, and its highest about twenty feet. During very high freshets the water flows back for many miles through the arroyos or sloughs which intersect the country: large lagunas or lakes are thus formed, such as the "Big Laguna," and "New River" or "Providence creek," found on the road from San Diego, and also Hardy's false Colorado; these remain filled for a long time—some nearly the entire year. Whenever they occur a broad slough, north and west of the post, is filled, and completely isolates it from the main land, communication being had only by means of boats.

There are only three kinds of fish, that are at all palatable, caught in the Colorado—the hump-back, trout, and buffalo—all very soft and of a muddy flavor, full of small bones and of most inferior quality.

Fort Yuma is well located for defence against the Indians; the only point (Sierra Prieta) commanding it is beyond the reach of arrows. It affords a distant and fine view of the surrounding country. In the very interesting report of Major Heintzelman, made to the commanding general of the Pacific department, in July, 1853, he says: "The post is on the site of a Presidio established about seventy-seven years ago by the Spaniards. Padre Pedro Garces came out here with a San Gabriel Indian, and reported this a favorable position for a mission. The next year he and Padre Kino came out with troops and established a mission at the junction, and José Maria Ortegas, son of Don Francisco Ortegas, captain and commandante of the expedition of the discoverers of Alta California, founded the Presidio. The position is described between the sierras of San Pedro and San Pablo. A little east of north from here, forty-five miles, on the top of a ridge of barren mountains, is a detached rock, several hundred feet high, resembling a dome, which may have given it the name of St. Peter; and in a direction west of north, about eighteen miles distant, on another range of mountains, rises a solitary rock, five hundred feet high, which we have called Chimney Peak, and which must have borne the other name."

Our camp lay opposite the military post, on the left bank of the Colorado, between the Plutonic ridge on the east, and a low range of sand and gravel hills, called the Yuma hills, on the west; these latter end abruptly at the water's edge, no trace of them being seen on the opposite side, and extend south to the base of the Sierra Prieta. They were interesting from the beautiful specimens of quartz found upon them, among which were fortification and moss agates, chalcedony, jasper, and opals, and various fine pieces of petrifactions of mezquite, cottonwood, and indigenous plants, and one of palm-wood. Seven miles and a half by the river, below the post, is another high, prominent, and isolated hill, called Pilot Knob, similar in general appearance and formation to those spoken of. The boundary line from the initial point on the Pacific ocean runs tangent to the southern base of this butte, until it intersects the middle of the Colorado, a short distance below the south ferry. An iron monument formerly marked the

line near this place, on a high knoll, but has been broken into a thousand pieces by the Indians; its locality, however, is well defined. From this point of intersection the boundary follows down the middle of the stream to a point 20 English miles, in a straight line, below the junction of the Gila and Colorado.

Near Pilot Knob, a large belt of white, glistening sand encroaches upon the river to within a short distance of its right bank; it is fifteen miles long by five wide, and about forty feet high; from its gradual approachment, it threatens to dislodge the river and efface its present bed. Twelve miles above the junction, a spur of the "Sierra de la Gila," a mass of sharp, angular, igneous rocks, thrown together in the most incongruous shapes, sets into the Rio Gila; its bearing is northwest and southeast, and it extends as far as the eye can see. From the base of this mountain, along its whole length, extends out towards the Gila and Colorado a level plain of gravel and sand, in breadth from twenty to fifty miles, and stretching far south until it mingles with the hillocks of white sand which define the eastern shore, along the Gulf of California. It limits the bottom-lands, sometimes touching the river, as at Ogden's landing, and again recedes, leaving a fertile tract of several miles in width. The latter is from two to ten feet above the surface of the water, and the former rises in bluff banks from twenty to forty feet in height. The plain is a perfect desert, marked by an entire absence of water, and destitute of vegetation, save some few sickly plants: the Larrea Mexicana and the Fouquiera, the natural growth of such barren localities, only add to the gloomy sensation produced by the scorched sterility spread out to view, with jagged ridges of hills lying in the back-ground. The bottom-land on the right bank of the Colorado is bounded by a similar plain, which extends south to the base of the mountains of Lower California. This whole country is truly a desolate region; rich, however, in geological and mineralogical material.

Standing on the top of the Sierra Prieta, you have a magnificent panorama of the high peaks, rugged sides, and angular outlines of the mountain ranges which encircle you. From this point, looking westward and following the points of the compass round towards the north, your eye first rests upon Avie Quah-la-Altwa, (Avie signifying mountain, in the Indian tongue,) or Pilot Knob, as known to emigrants; a little further on, Avie A-re-ña Hampan, connecting with the low ranges of white sand-hills already spoken of; then Avie Qui-a-sa viño; to the northwest a light and a dark range, Avie Qui-a-sa and Avie Haz-e-nas; afterwards Avie Sut-ma-mou-ra—all isolated ridges. Ranging across the north is Avie Mil-li-ket, its highest peak called by the Americans "Chimney Peak," and by the old Jesuits "San Pablo." The Indian name is in honor of a learned and wise chief, who became a deity after his death. He occupies a large cavern in the mountains, the entrance to which is guarded by a raccoon, a pet during his stay upon earth; the path which leads from the cave to the river bank is said to be distinctly marked by his foot-prints. He seems to enjoy long intervals of sleep, and when aroused from his slumbers by the wickedness of his worshippers, he is believed to change his position, and the act of rolling over causes the rumbling earthquakes which are frequently felt throughout this section of country. During the last shock experienced there, it is reported that a large piece of the peak of Mil-li-ket, solid rock as it is, was broken off, and rolled into the plain beneath. The Indians, considering it a part of their religious duty, make regular visits to the spot, like Mahomedans to the shrine of Mahomet. To the east of Mil-li-ket is another remarkable-looking peak, called Pin-chie, the allegorical allusion scarcely bearing mention; the two are almost in juxtaposition. Avie Mil-li-ket is quite an extended range, and is about twenty-four or five miles north of Fort Yuma. To the northeast, and about forty-five miles distant, is Avie Tok-a-va or Dome mountain, or

Sierra de San Pedro, a solid rock many feet in height, and resembling the dome of a cathedral. Some god is supposed to inhabit this range. Near it is a second peak, called the "broken dome." To the east, and extending south, are Cone mountain, of the Santa Isabel range, and the Sierra de la Gila; Antelope peak is the principal one of the latter. To the southeast, mountain after mountain rises up; to the south, those of Lower California are plainly visible, so high that snow envelopes their tops; and when the southwest winds blow, they are more chilly than those from the north, bearing along with them the cold air of the snow-clad peaks. From a distance these mountain ranges look rugged in the extreme, although here and there, as you watch the play of the sun, you see reflected back perpendicular walls of smooth, white rock.

The atmosphere is so clear that you are able to see at long distances. In the morning a beautiful sight is afforded by the mirage. It has the effect, apparently, of raising the mountains and bringing them more plainly to view, and many are the fantastic and peculiar shapes that are represented.

We turn from this barren view and look with pleasure upon the bright green foliage which marks the course of the Colorado. The river-bottom, varying in width, is generally broad and fertile—an alluvial deposite, covered with a thick growth of timber. Large cotton-wood trees, different varieties of willow thickly matted together, and impenetrable thickets of arrow and grease-wood, grow near the river; further back the mezquite of two kinds—the flat-pod and the screw-bean—thrive and flourish. The bottom is intersected by innumerable lagoons and sloughs, which during the annual rises fill to overflowing, and irrigate the soil. The earth is consequently impregnated with the salts of potash, magnesia, and soda, which are held in solution by the water. No vegetation will grow beyond the influence of these overflows, and when a white efflorescence appears upon the surface of the ground it is useless to plant, as nothing edible for man or beast will grow there.

The delta of the Colorado and Gila is below high-water mark, and is subjected to overflows. The soil is a mixture of clay and sand. There are some few varieties of grass very scatteringly distributed. The distance from Fort Yuma to the mouth of the Colorado is about one hundred and sixty miles. The whole of the country strongly resembles the Rio Bravo del Norte in the general appearance of its vegetable forms; varieties of cacti, the maguey plant, Larrea Mexicana, and the fouquiera, are all found here. Although both regions are probably of the same geological structure, they are not equal in richness, that upon the Rio Grande being the most fertile. To add to the interest of this section of our land, we find it is subject to earthquakes, by which it is sometimes depressed and sometimes elevated. To quote from a very interesting account given by Major Heintzelman of a visit made to the scene in November, 1852, he says: "The low ground was full of cracks, from many of which there gushed forth sulphurous water, mud, and sand. At the time, great changes were made in the river-bed. The earthquake appears to have been occasioned by an accumulation of gases and steam in the caverns of the earth. The elasticity of these forced an escape through a pond forty-five miles below, on the desert between the river and coast mountains, the repeated escapes causing rumbling and shocks. It is an old orifice, that has been closed several years, so that the first effort occasioned the most violent explosion. The steam rose in a beautiful snowy jet more than a hundred feet in the air, and spread, appearing above the tops of the mountains like a white cloud, and gradually disappeared. This was repeated several times, but on a much smaller scale."

When the Major visited the place three months later, "these jets took place at irregular intervals of fifteen or twenty minutes, and had a beautiful effect as they rose, mingled with th black

water and mud of the ponds. The temperature in the principal pond was 118°, and in a smaller one 135°. One of the mud-holes from which gas escaped was 170°. The air was filled with sulphuretted hydrogen, and in the crevices were beautiful yellow crystals of sulphur. The ground was covered with a white efflorescence, tinged with red and yellow."

The climate of this region is in accordance with everything else relating to it. Encamped there during the three winter months, we found the weather generally mild, although the changes in temperature were very great; the thermometer during part of this time as high as 90° Fahrenheit, and then as low as 30°. The days were sometimes uncomfortably warm, and the nights intensely cold. Living and sleeping in tents all the time, we seldom had occasion to have a camp-fire except at early dawn. Owing to the clearness of the skies, the radiation is extremely rapid, and ice forms quickly.

Having returned the following August to Fort Yuma, the thermometer in the shade at the post was found to be 116° Fahrenheit, and over 120° in the shade along the river. The heat, commencing to be excessive in May, becomes almost unendurable in the months of June, July, and August. Even in winter the sun is so hot, and the direct as well as reflected light upon the sand-plains so dazzling, that, excepting a couple of hours after daybreak and an hour before sunset, it is only possible to see objects through the best instrumental telescopes in the most distorted shapes—a thin white pole appearing as a tall column of the whitest fleece.

In this belt of country rain seldom falls; in the distance dark clouds may be seen hanging over the California and Sonoranian mountains, but they seldom visit the intermediate localities. During the whole of one year they had but two inches of rain. After our arrival a few drops from some passing cloud fell in the two winter months, December and January, and in the following February .07 of an inch. The coast rains take place during the winter; and the rainy season in Sonora, the Mexican state south of the boundary line, in the months of July, August, and September. Spring, in the intermediate section, puts forth its thick green foliage in February, without any rains to refresh and cool the parched ground.

Instead of storms of rain during the winter and spring, they have those of dust and sand. These are caused by high and strong winds sweeping over the desert plains, coming principally from the northwest, raising and carrying before them, like mist, clouds of pulverized sand and dust. You can watch them in their progress as they approach for hours beforehand, and when they reach you the dust penetrates into every crevice, the finest silk not being impervious to it. They last generally a day; sometimes three. The winds blow up quickly and violently, and it is useless to attempt to work with nice instruments. These dust-storms were our great drawbacks, as it was impossible to see many feet distant, and then only at the risk of being blinded. The gusts of wind which produce this unpleasant effect in winter are in summer like the simoons of the Sahara—they sweep over and scorch the land, burning like the hot blasts of a furnace.

Think of those officers and soldiers who are so unfortunate as to be stationed at Fort Yuma. Two companies of artillery now garrison the post; their quarters have heretofore been Mexican *jacals*—upright mezquite poles, plastered with mud and covered with a thatching of arrow-wood; like so much powder, a single spark ignites them, and they burn like a flash in the pan. Dust and rain, as well as the eyes of the curious, penetrate through the crevices, the sun only being denied admission. When I left they were engaged in building new quarters of adobes, (sun-dried brick.) As every other comfort is denied them, their dwellings at least should be substantial and cool.

Arthur Schott del.

Lith. of Sarony & Co. New York

DIEGEÑOS

Among the curiosities of the country are its aborigines. On the road from San Diego to Fort Yuma we passed through several Indian settlements of the Diegeño tribe, at San Pasqual, Santa Isabella, San Felipe, &c. These Indians were converted by the Jesuits, who many years ago organized missions throughout this country; they became partly civilized, and were industrious and happy, and collected many comforts about them. Naturally lazy, and incapable of self-government, and deeply imbued with all the traits of the wild Indian, they easily degenerated after the missions had fallen from under the rule of the church, and have become absolutely worse than in their original condition. Then they were simply children of nature, following the bent of their inclinations, with few comforts, and fewer wants; now they have learned sufficient to be exceedingly avaricious and unscrupulous—a herd of drones and beggars, their dispositions thievish, and forever on the watch to commit some petty larceny. They call themselves "Christianos." The degradation of the Indian woman is only surpassed by that of those off-scourings of creation, the male white population who wander over the country.

The women are beautifully developed, and superbly formed, their bodies as straight as an arrow; their features, however, are coarse and uninviting, their persons filthy, and their actions still more disgusting. They imitate the whites in dress, and in a single Indian group you see the odds and ends of clothing from all parts of the globe most fancifully and grotesquely worn. Don Tomas, the chief of the Santa Isabella Pueblos, is quite a fine-looking person, and has considerable reputation as a man and warrior. He goes about dressed in a full-dress soldier's coat and shirt, but no breeches; carries an old sabre as a sword of justice and rod of correction, judging from the way I saw him use the flat of it on the back of a drunken Indian.

The opposite picture is a lithograph of a Diegeño, wife and child—the one leading and the other riding a mule—as we met them travelling to the "Agua Caliente," near Warner's rancho.

There are many Indian tribes scattered throughout this part of California; but I will confine my remarks particularly to those dwelling on the Colorado and Gila. From about sixty miles above Fort Yuma to within a few miles of the most southern point of that part of the Colorado forming the boundary, live the Cuchanos, or Yumas. A belt of land of some few miles in width, forms neutral ground between them and the Cocopas; the latter living below, and near the mouth of the Colorado, within the limits of Mexico, and the former almost entirely in the United States. These, together with the Maricopas, who now live up the Gila among the Pimos, originally formed one tribe. Disagreeing upon the choice of chiefs, they separated; until recently, they have been deadly enemies, carrying on a war of extermination to the knife. The continued warfare with each other has compelled them to manifest a seeming friendship for the whites, has occasioned great loss of life and property, and been detrimental to their increase. In consequence of their great suffering, the Cuchanos have found it necessary and expedient to live near the post; every day, numbers are seen loitering about the parade-ground, and through the quarters of officers and men. These tribes speak the same dialect, follow the same habits and customs, and dress in the same manner and of the same materials. The Maricopas, however, are fast becoming embodied with the Pimos, and seldom visit their kinsmen. The Yumas and Cocopas are said to be very treacherous races; they conquer not by fair and honorable contest, but by craft and cunning, and midnight attack; they steal upon their enemies under the cover of night, and beat out the brains of their unsuspecting foes with clubs; or, under the garb of friendship and peace, invite each other to feasts, and suddenly

fall upon and kill their guests; or, taking advantage of the absence of the warriors from their villages, massacre the remaining men, old women, and small children, and carry off as prisoners the more youthful women and larger children. They look upon this kind of warfare as right and honorable. They follow their war expeditions on foot, possessing only a few horses.

Their hunting as well as war weapons are bows and arrows, clubs and knives. I have not seen a rifle or gun of any kind among them. The bow is made of willow; the arrows are of reed, part of the shaft of arrow-wood—the point tipped with a head of hard stone, either jasper or agate, small, but neatly and sharply edged; they are winged with the gay feathers of the various birds of this country. Their clubs are of mezquite wood, three or four feet long. On one occasion, as Major Fitzgerald was escorting a train up the river, he discovered them moving their families; pressing them too hard, they turned upon his command, and, in defiance of powder and ball, attacked it with clubs at the very bayonet's point and forced the soldiers to retire.

An instance of the stratagem and bad faith practised by these different tribes upon each other, was told me by the officers at the post. The Cocopas planned the massacre of all the captains of the Cuchanos in 1851, to accomplish which they intended inviting them to a feast and slaying them. The plan was overheard and told the Cuchanos; the latter fell upon the former the same night, killing several men, and carrying off women and children. To repay them, the Cocopas made a visit to the Cuchanos to recover their prisoners, and again invited the latter to a feast, who unsuspectingly accepted; during their absence, the Cocopas fell upon their villages and reciprocated the treatment they had previously received. Macedon, the principal chief of the Cuchanos, was killed on this occasion; he was much beloved by his tribe, and is spoken of as an intelligent and high-minded Indian; his death is said to have occasioned much grief. This was the time of the outbreak of Antonio Garras, who had leagued all the tribes of Indians of South California against the whites, intending by a simultaneous and well-concerted attack, to annihilate the Americans and drive them from the country. He was afterwards taken and shot by the military at San Diego, where his grave is pointed out to the passer-by.

On several occasions, the officers commanding at Fort Yuma have been instrumental in securing peace; but the Indians being naturally suspicious of each other, it does not continue long. A treaty was made between them whilst we were encamped on the Colorado. The Cuchanos were anxious for, and had often sent down their women to propose one. Owing to the number of intermarriages among the tribes, this is the usual mode of proceeding. At last, through the influence of Major Thomas, a day was appointed for both parties to meet at the post. Francisco, an intelligent, splendid-looking young Indian, and brother to the murdered Macedon, was sent down the river to bring up the Cocopas chiefs. Four of them and their women arrived on board the steamboat. José, Jepita, Coyote, and Colorado, representing the Cocopas, and Pasqual, an immense man, near six feet four inches in height, Caballo-en-pelo, and Vincente, figured on the part of the Cuchanos. All made speeches; and when assenting to any particular view advanced, on either side, they commenced with the principal chief, and passing round the whole circle from one to another, in the order of rank, each one expressed his approval by the monosyllable, "good." After the words of the treaty had been agreed upon, the Major asked each one to make a sign or mark opposite his name. Before having time to explain its purport Jepita jumped up, and, with very energetic language and appropriate

gesture, stated that their word was as good as their mark; but that they would make any of their signs, such as "kneeling upon one knee," "raising the hand to heaven," or "embracing." Immediately putting his words into effect, he walked up to Pasqual, and taking his large frame in his arms, gave him a long and tight embrace. After the ceremony was over, rations were issued to them, which they devoured with right good will. They then went about begging for old clothes, and in the evening celebrated one of their games.

The association of the Indian with the white tends to cause a rapid decrease by the introduction of diseases among them heretofore unknown; war, too, among themselves is a great exterminator, but has the advantage of making them more dependent upon the whites. Thinking the military will protect all, they draw near to the posts, and from presents learn the use of various articles of clothing and food; these, now regarded as luxuries, will, in time, become to them necessities. They, too, learn and see the advantages which the whites possess over them in every respect, and are not slow either to admit or account for it. They say that whites and Indians at one time were all one tribe, equally well informed, and acquainted with the use of implements of husbandry and of all useful articles. Differing upon the choice of a chief, they quarrelled, and during the night the whites stole a march upon them, carrying away everything, and leaving the poor Indian in the dark. These Indians are of a dark brown color; during the cold weather, of dull and dirty appearance, but in summer bright and glossy from bathing in the river. They are most expert swimmers. They are of the medium height, well formed, and slender; not muscular, the deltoid muscles alone being largely developed, arising from the peculiar mode of throwing the arms while swimming; active and clean-limbed; their features not disagreeable, although they have large noses, thick lips, and high cheek-bones; their chests are well developed and figures manly, indicating activity but not strength. The women are under the medium height: their figures are fine and plump; the bust is well developed, the mamma firm; the arms finely moulded; the hands small and pretty; the legs beautifully formed and well rounded, and nicely-turned ankles; the feet are natually small, but become much enlarged by not being protected. Altogether they present a very voluptuous appearance. Their deportment is modest, and their carriage and bearing erect and graceful. They all travel on foot, and when going long distances, at a slow trot.

An essential article of dress worn by the men is a piece of coarse cotton cloth, three or four feet long, passed between the legs, the ends drawn over a cord tied around the waist, and then allowed to fall loosely down. The women wear a very becoming and a very pretty dress. They take the inner bark of willow, cut into strips about an inch wide and sufficiently long to extend from the waist to the knee. A number of these pieces are woven together at one end and selvedged, the edge long enough to go half-way round the body; two of these pieces—the one called the a-be-hike, and the other the al-ter-dick—are secured in front and behind by means of a girdle of strips composed of the same material, and covering the body from the hips to the knees. The front portion is woven plain, but the back into an angular shape, with a lump at each side, answering the same purpose and appearing like a bustle. On this protuberance the women carry their children of two or three years of age, a rope passing around the groins of the child and the ends tied together in front of the mother; as she approaches you, nothing is seen but a little foot dangling down on each side. The belles of the tribe, however, when they can obtain the material, make the front of white woolen cord; they take a white blanket, pick the wool loose, and twist it into cords of some thickness, and use this in place of

the willow-bark; they tip the ends of the cords with bits of red flannel; the girdle is then made of cords of the same kind, only variegated with different colors, red, white, and blue. When they lie down to sleep, they strip and cover themselves with their clothes, having nothing beneath them; in winter they keep warm by lying near a fire. The hair of both males and females is cut square across the forehead above the eyes, the sides and back left long; the men wear it very long, as it is considered a great ornament, and braid it in rolls; the latter are used for the purpose of securing their bows, arrows, and clothes above water when swimming a river. The women do not wear it as long as the men. They speak of one of their celebrities, now dead, with great respect, as the warrior with the very long hair. Both sexes paint; the usual colors are vermilion, black, and blue. A very few are tattooed; this operation is performed by pricking the skin with the sharp point of a flint, and sprinkling in the wound the dust of charcoal. Very few ornaments are used. The chiefs of the various bands seem to have a distinct official badge, consisting of pearl-shells suspended by rings from the nose. Both men and women are passionately fond of glass beads.

Although their language is not sweet, the sounds being guttural and harsh, still their names are very pretty. Three of the belles of the tribe were named Ma-vah, He-pa, and Le-och. There appears to be no marriage ceremony. If a man and woman like each other, they live together; if they afterwards disagree they can separate, provided there be no children, and even then they can marry again should both parties consent. Unmarried women are taken care of by the tribes; children can go from one hut or family to another, and will be fed and cared for as belonging to the tribe. Nor do they have any funeral ceremonies. When a death occurs they move their villages, although sometimes only a short distance, but never occupying exactly the same locality. The dead is burned; the body, dressed and surrounded with all the personal effects, is placed upon a funeral pile and consumed. No disposition is ever made of the ashes. A feast is celebrated, and if the deceased is possessed of any horses they are killed and eaten; his possessions are said to be bad, and are burnt or destroyed. The female relations of the departed mourn for many days, manifesting their grief by tearing out their hair, cutting their bodies, and destroying everything they possess, not even saving a vestige of their garments. If any member of the tribe should kill another, whether in the heat of battle or in cold blood, he returns to his home and atones for the necessity of having been compelled to commit the deed by keeping a fast for one moon; on such occasions he eats no meat—only vegetables—drinks only water, knows no woman, and bathes frequently during the day to purify the flesh.

Among these tribes they have a ceremony for celebrating the arrival of a virgin to the age of puberty. When the old women ascertain the fact, the whole tribe collect together and celebrate the occasion with a feast. The applicant for womanhood is placed in an oven or closely covered hut; this is made by digging a hole, in which they lay heated stones, covering them with twigs and bushes, upon which the novice is placed; hot water is then thrown upon the stones, and when completely steamed and saturated with profuse perspiration, she plunges into the river and takes a bath. This process is kept up for three days, maintaining a fast all the time. The feast celebrated, the girl is considered a woman, and is ready for marriage; maidens, however, do not generally marry early. They become fully developed at about twelve or fourteen, and grow so rapidly that in a few years they look coarse and fat. Previous to birth, the mother leaves her village for some short distance and lives by herself until a month after the child is born; the band to which she belongs then assembles and selects a name for

Arthur Schott del.

Lith. of SARONY, MAJOR & KNAPP, New York.

YUMAS

FIGURE TO THE LEFT, PORTRAIT OF LEOCK.

S. Arthur Schoff del.

Lith of SARONY, MAJOR & KNAPP, New York.

CO-CO-PAS.

the little one, which is given with some trivial ceremony, and the mother then returns with it to her home.

Nothing is known of their religion. At one time they profess to worship the sun and moon; at another they say the Indian and white man have the same God; then you find them making pilgrimages to the sepulchre of some departed chieftain, celebrated for deeds of valor or civic honors.

As to their government, they are divided into bands, each having its own head. There is one principal hereditary chief presiding over the whole. Each of the former, with the advice of its members, decides upon all affairs relating directly to the band to which he belongs. Any important business affecting the whole, is acted upon by a council of chiefs—the principal chieftain governing their deliberations. Each chief punishes delinquents by beating them across the back with a stick. Criminals brought before the general council for examination, if convicted, are placed in the hands of a regularly appointed executioner of the tribe, who inflicts such punishment as the council may direct.

An execution took place among the Cuchanos whilst we were in their neighborhood, which created great sorrow among us all. An Indian boy named "Bill" was in the habit of going up and down the river on board the steamboat, and frequently visited the post and our camp. Being very smart and good-natured, he became a great favorite; and speaking some little English and Spanish, could act as interpreter. He was secretly accused and tried before the council for "being under the influence of evil spirits"—the evidence going to show, that for the sake of frightening a little child he had forewarned it of its death on the following day, which, in reality, accidentally took place. He was convicted and sentenced to be executed. Whilst seated on the ground with three others of his tribe, laughing, talking, and playing cards, the executioner walked up behind him and struck him three blows upon the forehead and each temple, killing him instantly.

Their games are few. The principal one is called mo-upp, or in Spanish, redondo, played with two poles fifteen feet long, and a ring some few inches in diameter. They play another with sticks, like jack-straws; also monte and other games of cards, but know no ball plays. Old and young join in the games. Different from most Indians, they seem to be good-natured, laughing and talking all the time. They are very affectionate towards each other, and it is not unusual to see them walking with their arms around each other's waists.

Music is not much cultivated among them. They sing some few monotonous songs, and the beaux captivate the hearts of their lady-loves by playing on a flute made of cane. They manufacture but few articles. The women make baskets of willow, and also of tule, which are impervious to water; also earthen ollas or pots, which are used for cooking and for cooling water; they answer the latter purpose very well—being porous, the water oozes out and evaporates on the surface. The men make headstalls and reatas for horses.

Although constantly in the water, these Indians never use canoes, but swim from shore to shore; and in the event of moving their families some distance down stream, they place them on rafts of wood or balsas of rushes, push them out in the channel, and trust to the current, directing their movements with a pole.

Owing to the mild climate and the absence of rains, they require but little shelter, and their houses are of the meanest construction. Sometimes they make them of upright poles a few feet in height, crossed horizontally by others on the top, upon which rest brush and dirt. The

side to the prevailing wind is sloped towards the ground. They usually select a sandy spot, as it is warmer in winter and cooler in summer.

Major Heintzelman, in speaking of their agriculture, says "it is simple; with an old axe, (if they are so fortunate as to possess one,) knives, and fire, a spot likely to overflow is cleared; after the waters subside, (those of the annual rise,) small holes are dug at proper intervals, a few inches deep, with a sharpened stick, having first removed the surface for an inch or two, as it is apt to cake; the ground is tasted; if salt, rejected, and if not, the seeds are planted. No further care is required but to remove the weeds, which grow most luxuriantly wherever the water has been. They cultivate watermelons, muskmelons, pumpkins, corn, and beans. The watermelons are small and indifferent, muskmelons large, and pumpkins good; these latter they cut and dry for winter use. Wheat is planted in the same manner, near the lagoons, in December or January, and ripens in May or June. It has a fine plump grain and well-filled heads. They also grow grass-seed for food; it is prepared by pounding the seed in wooden mortars made of mezquite, or in the ground. With water the meal is kneaded into a mass, and then dried in the sun. The mezquite bean is prepared in the same manner, and will keep to the next season. The pod-mezquite begins to ripen the latter part of June; the screw-bean a little later. Both contain a great deal of saccharine matter; the latter is so full, it furnishes, by boiling, a palatable molasses; and from the former, by boiling and fermentation, a tolerably good drink may be made. The great dependence of the Indian for food, besides the product of his fields, is the mezquite-bean. Mules form a favorite article of food; but horses are so highly prized, they seldom kill them, unless pressed by hunger or required by their customs." A lithographic sketch accompanies this report, depicting the appearance and dress of the Yumas, or Cuchanos.

Apart from my own observations of the Indians of the Colorado, I am very much indebted for my acquaintance with their habits and customs to the very interesting report of Major Heintzelman, from which I have taken the liberty to make some extracts, and also to frequent conversations with Major George H. Thomas, Dr. Robert J. Abbott, and other officers of the army stationed at Fort Yuma during our sojourn in its neighborhood. It may be pardonable in me to render here, by a passing word, an acknowledgment of the great kindness and consideration shown myself and assistants by all those officers whom we had the good fortune to meet after reaching the shores of the Pacific. Our wants were always kindly supplied, and all they could do was done, to expedite the work.

On examination, after arriving at Fort Yuma, it was found that the instruments were disarranged, and in some instances broken, in consequence of the numerous changes in the mode of transportation, and the rough road travelled over; they were, however, soon repaired, as well as circumstances would permit, and the work commenced very shortly after reaching the field of our operations.

Surveys of the meanderings of the rivers Gila and Colorado for short distances above their junction, and of the latter river from the junction down to the head of ship navigation, together with the roads in the neighborhood, were made by assistant surveyor A. C. V. Schott, assisted by Messrs. E. A. Phillips, C. Michler, and T. Cozzens. Owing to the thick underbrush along the banks, the work proved tedious.

Astronomical and meteorological observations were daily made by myself, assisted by Mr. G. Power, and the computations made by Mr. J. O'Donoghue. At the same time I carried on the triangulation "to a point on the Colorado river twenty English miles below its junction with the

Gila." In consequence of the thick growth of timber along the river, this was effected on the sand plain until near the terminal point. The timber on the bottom-land there is nearly two miles in width, and lines of sight for the theodolite had to be cut through it to approach the river. This obstruction delayed the work some time, and numerous dust-storms also impeded its progress, preventing the possibility of using any instrument for several days at a time.

On the 14th February, 1855, we moved the main camp from opposite Fort Yuma, in order to be more in the vicinity of our work; a beautiful mezquite grove near a laguna of fresh water was selected. This spot was close to the edge of the sand plain, and the nearest desirable one to the terminal point of the triangulation, about two miles distant in a direct line. It is the site of Fitzgerald's battle-ground, twenty-two miles, by the road, below Fort Yuma. We were here joined by our escort, company I, 1st artillery, officered by First Lieutenant (now captain) Francis E. Patterson, and Second Lieutenant Henry W. Closson.

By the 4th of March the triangulation and survey were all completed, an observatory erected near the initial point of the new azimuth line, (running eastward to the intersection of the 111th meridian west of Greenwich, with the parallel 31° 20′ north latitude,) and astronomical observations with the transit and zenith instrument commenced. Our lucky stars did not, however, prove to be in the ascendency; first, clouds obscured them, and then the rising waters of the Colorado did not leave us long undisturbed. There came a freshet from the Gila, far up in the mountains, causing the Colorado to rise very slowly—so slowly that we anticipated no danger. The sloughs began to fill up between the observatory and the camp; the men bridged them, and still we hoped to see the water recede before forcing us to move. Day after day it continued to advance upon us until the night of the 19th, when the instruments were packed and moved to a higher point, five hundred yards distant. By this time the water had entered the observatory, and to reach it we were compelled to wade waist-deep for nearly the whole of that distance. An extract from my notes of the 20th says: "Compelled again to move the instruments and carry them up to camp; every slough is filled, all rapidly rising, and several swimming deep; rafts built to transport the men over them; all the men in water up to their breasts, and instruments only kept dry by being carried on their heads. About noon all safely in camp; water within fifty feet of it, and everybody getting ready to leave. At sunset the river still continues rising, and gradually approaches camp, but so slowly that we are still in doubt. At 2 o'clock a. m., decided to take to the sand-hills; the long roll was beaten, the camp struck, the train loaded, and all moved on the high plain. Behind us lay a desert of sand forty miles across, and in front was spread a sheet of water several miles in breadth. From fifteen hundred feet the Colorado had widened to at least five miles."

After being forced from our position, the river commenced falling back into its old channel. The bottom-land had become so boggy, it was many days before we were able to reach our observatory. In the mean time, that portion of the Mexican commission appointed to co-operate with me arrived. The party was composed of Don Francisco Jimenez, 1st engineer, in charge, assisted by Señores Manual Alemán and Augustine Diaz, 2d engineers. Captain Hilarion Garcia and Lieutenant Romero were the officers of the escort.

Having already made much progress in the work, Mr. Jimenez consented to adopt the initial point fixed by me. He also accepted its longitude as determined by my triangulation. Having succeeded at length in reaching the river, we were both enabled to commence observing for latitude on the night of the 1st of April. After ten nights of successive observations a mean of the results of each party was taken as the final determination. The latitude of this initial

point on the Colorado is 32° 29′ 44″.45 north, and the longitude of same 114° 48′ 44″.53 west of Greenwich. The computed azimuth of the line connecting this point with the intersection of the 111th meridian and parallel 31° 20′ north, forming part of the boundary between the United States and Mexico, is at the initial point 71° 20′ 43″.8 southeast, and at the intersection 69° 19′ 45″.94 northwest, and its length 237.63565 English miles. The mean of eighty barometrical observations at this point is 29.871 inches, — .020 for non-periodic error = 29.851; the non-periodic error was obtained by comparison with observations made at San Diego. The height of this point above the level of the sea at San Diego is 156.3 feet; its distance below the junction by the meanderings of the river is 27.9 miles, making the mean fall of the river between these two points 4.26 feet per mile.

The magnetic variation of the initial point in March, 1855, was 12° 37′ 30″ east of north.

As it was impossible to mark the exact initial point in the middle of the stream, Mr. Jimenez and myself established the first monument 3,164.84 feet distant from it, in the direction of the line, at its intersection with the meridian of the observatory. The azimuth of this monument is 71° 20′ 25″ southwest. Monument II, of cast iron, and pyramidal in form, is placed on the edge of the sand plain, as this position is more permanent and free from the action of freshets in the Colorado. I give its astronomical position: Latitude 32° 29′ 01″.48 north, and longitude 114° 46′ 14″.43 west of Greenwich. The azimuth of the line is 71° 19′ 23″.18 southeast; its distance from the initial point is 4,522.9 yards. This monument erected, everything was in readiness to prolong the line. An agreement was drawn up between both parties to facilitate the tracing and marking of the line by working conjointly.

From the junction to Sonoyta, a Mexican and Indian rancheria, or village, situated near the middle of the line, two roads run. The first one, which we will now describe, crosses the desert west of the Sierra de la Gila, in a southeast direction, to a pass through one of its ridges leading to water-holes, called by the Mexicans, "Tinajas Altas." These are natural wells formed in the gullies, or arroyos, on the sides of the mountains, by dams composed of fragments of rocks and sand washed down by heavy rains; they are filled up during the rainy seasons, and frequently furnish travellers with water for many months of the year, being, in fact, their only dependence. There are eight of these tinajas, one above the other, the highest two extremely difficult to reach; as the water is used from the lower ones you ascend to the next higher, passing it down by means of buckets. It is dangerous to attempt the highest, as it requires a skilful climber to ascend the mountain, which is of granitic origin, the rocks smooth and slippery. Although no vegetation marks the place, still it is readily found. A variety of birds frequent the spot, principally the small, delicate humming-bird. The "palo de fierro" and the "palo verde" grow near the base of the mountain.

The distance to the "Tinajas" is forty-five miles, over the desert plain already described; the first twelve through the heaviest kind of white sand, and it is next to an impossibility for a train to pass over it, even by doubling teams—twelve mules to each wagon. Sixteen miles and a half further on you reach the "Tinajas del Tule," situated in the mountains of the same name, called so from the few scattered blades of coarse grass growing in their vicinity. The water here is found in an arroyo, walled in by huge high masses of granitic rocks, which present a peculiar appearance, as they lie in smooth whitish lumps huddled together in every possible way. The road winds through the ridges of this sierra for many miles, and then passes over a plain in an easterly course until it turns the southern base of the "Cerro Salado." From this point it follows up the valley of a subterraneous creek, (at two points of which sweet, or slightly

brackish, water can be had by digging) to an Indian village called Quitobaquita, fifty-four miles from "Tule." Midway between these two places is a low mezquite flat called "Las Playas," containing charcos, or holes, which are filled during the rainy season with water.

The second road from the junction, known by the name of the "Cabeza Prieta" route, from passing near "Tinajas," in the mountain of that name, after continuing up the Gila for forty miles, leaves it and joins the first at "Las Playas." At Quitobaquita there are fine springs running for the greater part of the year.

The road continues along the course of the subterraneous stream until you reach the Rancho de Sonoyta, thirteen miles and a half further on. From the junction to within a short distance of this place, a heavy road of one hundred and thirty miles, you look on a desert country. Near Sonoyta it is well covered with mezquite timber; in the valley, to the east of the town, there is some salt grass; but to the west, as far as the Colorado, scarce a blade is to be seen. A dull, wide waste lies before you, interspersed with low sierras and mounds, covered with black igneous rocks. The soil is a mixture of sand and gravel; the reflection from its white surface adds still greater torment to the intense and scorching heat of the sun. Well do I recollect the ride from Sonoyta to Fort Yuma and back, in the middle of August, 1855. It was the most dreary and tiresome I have ever experienced. Imagination cannot picture a more dreary, sterile country, and we named it the "Mal Pais." The burnt lime-like appearance of the soil is ever before you; the very stones look like the scoriæ of a furnace; there is no grass, and but a sickly vegetation, more unpleasant to the sight than the barren earth itself; scarce an animal to be seen—not even the wolf or the hare to attract the attention, and, save the lizard and the horned frog, naught to give life and animation to this region. The eye may watch in vain for the flight of a bird; to add to all is the knowledge that there is not one drop of water to be depended upon from Sonoyta to the Colorado or Gila. All traces of the road are sometimes erased by the high winds sweeping the unstable soil before them, but death has strewn a continuous line of bleached bones and withered carcases of horses and cattle, as monuments to mark the way.

Although I travelled over it with only four men in the most favorable time, during the rainy season of Sonora, our animals well rested and in good condition, still it was a difficult undertaking. On our way to the post from Sonoyta we met many emigrants returning from California, men and animals suffering from scarcity of water. Some men had died from thirst, and others were nearly exhausted. Among those we passed between the Colorado and the "Tinajas Altas," was a party composed of one woman and three men, on foot, a pack-horse in wretched condition carrying their all. The men had given up from pure exhaustion and laid down to die; but the woman, animated by love and sympathy, had plodded on over the long road until she reached water, then clambering up the side of the mountain to the highest tinaja, she filled her bota, (a sort of leather flask,) and scarcely stopping to take rest, started back to resuscitate her dying companions. When we met them, she was striding along in advance of the men, animating them by her example.

On our return we had to ride to the "Tinajas Altas," forty-five miles, the first night to reach water; and the second one over sixty-three to "Agua Dulce," where we managed to obtain some by digging. During this time our poor mules plodded through the heavy sand without rest or food.

It was over this country one portion of the new boundary line was to be traced; the road

of which I have just spoken runs immediately along the line, and is the only practicable one connecting California and Sonora.

Before completing the work immediately on the river, a party had been sent out to make a reconnoissance in the direction of the line, and principally to examine the country for water. Anxious to have no delay, as the hot weather was fast coming on, and the river-bottom having become so infested with mosquitoes as to make life unendurable and labor of any kind impracticable, we commenced prolonging the line without awaiting the return of the reconnoitring party. Mr. Phillips, in the performance of this duty, reached the Tinajas, but there found very little water, and what there was, difficult of access; and, although directed to some new water-holes by a Papago Indian, still he only found sufficient to last a short time for a small number of men and animals. Mr. Alemán, of the Mexican commission, also endeavored to travel the road; but meeting the party first sent out, and hearing their report of the entire absence of water from the river to Sonoyta, was compelled to turn back.

The escort and provision train likewise made an attempt, but it was found almost impossible to advance more than a few miles with the heavily-loaded wagons. My own success was little better; starting from our camp with a light spring-wagon and six good mules, I managed to make twenty-five miles in twenty-eight hours' constant travel; an express then reached me from Mr. Alemán, informing me of the unfavorable account of the search for water.

Not finding it feasible to carry out our plan of operations, the parties of both commissions retraced their steps to the Gila. Every effort had been made to prosecute the work, under the most trying circumstances, but we found it useless to contend against impossibilities. It was then agreed by Mr. Jimenez and myself "to cease operations at the west end, and to proceed along the Gila to the east end of the azimuth line, there to fix the point of intersection of the parallel 31° 20′ north latitude with the 111th meridian west of Greenwich, and afterwards to trace the line from that point westward as far as practicable."

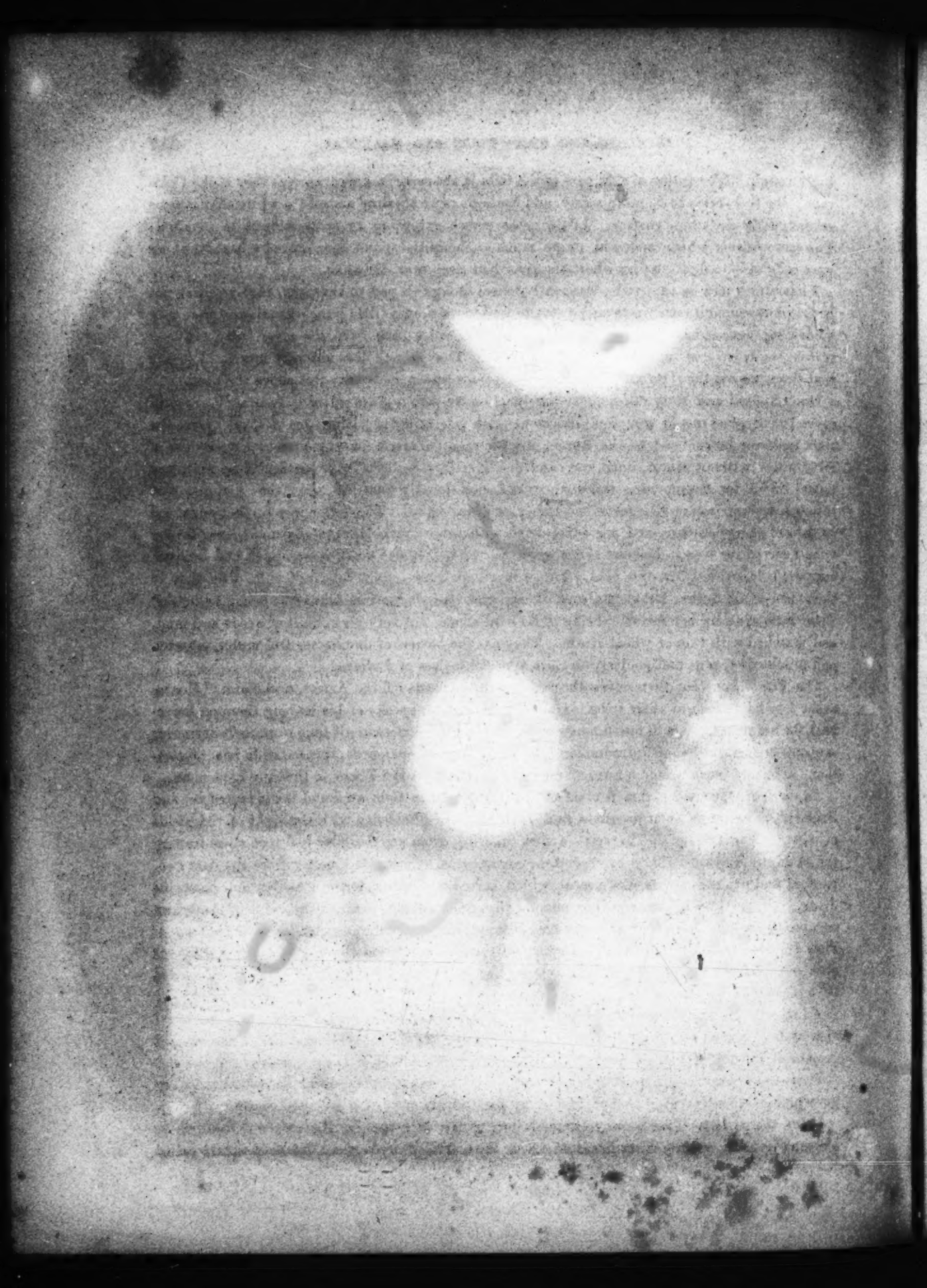
On May 5th both parties, American and Mexican, took the road leading up the Gila; this journey was a long and tedious one, our mules having been thoroughly used up in their service on the desert. During the whole winter they had had but scanty grazing, and to find any at all had to be driven ten miles up the Gila. As there are but three or four families of whites living on the Colorado, and those only in charge of ferries, they did not pretend to cultivate the soil and raise grain; and at the post they had only sufficient for their own use. For some little barley, shipped at San Francisco and brought round by water, I paid twelve cents a pound, and for hay one hundred dollars per ton.

The condition of our animals compelled us to make but short marches each day, to enable them to recruit.

As the road we followed has been travelled and reported upon by others, I shall not dwell long upon the subject. It continues the greater part of the distance in the valley of the Gila, occasionally leaving it for a few miles to go upon the sand plains bordering the bottom-land, or where hills jut into the water's edge, such as "Los Metates," "Lomas Negras," or "Lomas del Muerto," either following round their bases or crossing them. The last named is really the only difficult place in the road, but a trying one for mules and wagons. It is 110 miles above Fort Yuma, and consists of steep, rugged buttes, which, in a low stage of the river, can be avoided by crossing to the other side, but in high water must be passed over. Here are several severe ascents and descents, one at an angle of forty-five degrees, where it is necessary to let wagons down by ropes; they are also covered with vesicular rocks, making them exceed-

Arthur Schott del. Lith. of SARONY, MAJOR & KNAPP, New York.

PIMO WOMEN.



ingly rough. The valley of this part of the Gila is the same in appearance as that of the Colorado; the soil seems to be more sandy, and contains more alkaline matter; a white efflorescence covers nearly the whole surface. Little grass grows excepting in spots subject to overflow. The same freshet which molested us so much at the initial point here proved a benefit, as we were only able to find grazing where the river had risen over its banks.

I have been told by those who frequently travel along this part of the river, that you may not be fortunate enough once in twenty years to find more than a little bunch-grass, and that only by driving your animals to the plains, four or five miles back from the river. By constant search, we discovered sufficient for our purposes. The growth does not vary much. For the first time, we see the "cereus giganteus," as it rises fifteen or twenty feet above the head.

One hundred and forty miles above the junction we pass a place called "Tezotal." Several miles before reaching it you find limestone rock intermingled with seams of trap. Here the river makes a large bend to the north, and the road pursues a direct course over a *jornada* of forty miles without water, until you reach the Maricopa wells. After leaving these wells you again travel for twenty-nine miles along and occasionally touching the river; you also pass through several Indian villages of the Pimos and Maricopas. The former are further advanced in the art of agriculture, and are surrounded with more comforts, than any uncivilized Indian tribe I have ever seen. Besides being great warriors, they are good husbandmen and farmers, and work laboriously in the field. The women are very industrious, not only attending to their household duties, but they also work superior baskets, cotton blankets, belts, balls, &c. Their huts are very comfortable, being of an oval shape, not very high, built of reeds and mud, and thatched with tule or wheat-straw. They are the owners of fine horses and mules, fat oxen and milch cows, pigs and poultry, and are a wealthy class of Indians.

The Pimos consider themselves the regular descendants of the Aztecs, and claim "Montezuma" to have been of their tribe. One of their legends speaks of his leaving them on horseback on his prilgrimage to found a new country. As the Aztecs in all human probability never saw any horses until their introduction into Mexico by the Spaniards, this seems to be a fabrication. The Aztecs, too, had a form of religious service, but the Pimos to this day have none.

As we journeyed along this portion of the valley of the Gila we found lands fenced in, and irrigated by many miles of acequias, and our eyes were gladdened with the sight of rich fields of wheat ripening for the harvest—a view differing from anything we had seen since leaving the Atlantic States. They grow cotton, sugar, peas, wheat, and corn; from the last two, parched and ground, they make a meal, which, mixed with water, forms a cooling and palatable drink. From the large emigration passing through they have learned the value of American coin, and you can use it in the purchase of anything. Encamping one day at the village of their principal chief, "Cola Azul," a swarm of them soon infested the camp, bringing different articles for sale or barter. In a short time we had laid in a large supply of corn, much needed for our poor worn-out mules.

A little hillock stands near the village, used as a look-out, from which you have a beautiful view of rich cultivated fields. As I sat upon a rock, admiring the scene before me, an old grey-headed Pimo took great pleasure in pointing out the extent of their domains.

They were anxious to know if their rights and titles to lands would be respected by our government, upon learning that their country had become part of the United States.

From the Gila to Tucson—a military colony of the Mexicans on the extreme frontier—is a second jornada, seventy miles in extent. Near the middle of it you pass a detached sierrra called

"Picacho," or peak, an upheaval of volcanic rocks. Tinajas are here found which remain filled with water for short periods after the rainy season.

Several miles before reaching Tucson you strike the bed of the Santa Cruz river, but the stream is subterraneous until you reach the town. The latter is inhabited by a few Mexican troops and their families, together with some tame Apache Indians. It is very prettily situated in a fine fertile valley at the base of the Sierra de Santa Catarina. Some fine fields of wheat and corn were ready for the sickle. Many varieties of fruit and all kinds of vegetables were also to be had, upon which we indulged our long-famished appetites. The Apaches, under the direction of the Mexicans, do most of the labor in the fields.

Circumstances were such that my party and escort were compelled to remain encamped near this town for nearly the entire month of June. During this time we became the recipients of every attention and civility from Captain Garcia, who commanded the place, and from his family. We cannnot find words to express our thanks for their uniform kindness and constant efforts to make the time pass pleasantly.

The month was judiciously occupied in repairing the train and recruiting the mules. Having learned previously on the Gila of the presence of the commissioner and the parties immediately under his charge at his camp near Los Nogales, sixty-nine miles distant from Tucson, my party was directed to stop, while I continued on to have an interview with him.

The road lay in the valley of the Santa Cruz as far as the "Rancho de las Calabasas," between high mountains. On the east are the Santa Catarina, with its top covered with lofty pines, and the Santa Rita rich in minerals; and on the west are the Sierra Rica and the Sierra Atascosa.

A fine specimen of meteoric iron brought from the Santa Rica is to be seen at Tucson, and is used as a blacksmith's anvil. It is massive, and quite malleable.

You pass through the towns of San Javier and Tubac, and the mission of Tomocacari. The first place has been ceded by the Mexicans to the Papago Indians. A beautiful church, with its exterior walls richly ornamented, carved, and stuccoed, and the interior handsomely decorated and painted in bright colors, with many paintings in fresco, still stands as a monument to the zealous labor and religious enthusiasm of the Jesuits of the past century.

Tubac is a deserted village. The wild Apache lords it over this region, and the timid husbandman dare not return to his home.

The mission of Tomocacari, another fine structure of the mother church, stands, too, in the midst of rich fields; but fear prevents its habitation, save by two or three Germans, who have wandered from their distant fatherland to this out of the way country.

Leaving the Santa Cruz river at the rancho, and following up the pretty little valley of Los Nogales for several miles, brought me to the camp of the United States commissioner. It was a gratifying sight, and refreshing to the senses, as I traversed these valleys, to see them clothed with rich green verdure, and contrast them with the bleached barrenness of the Colorado and Gila.

On my arrival, I found the observations for determining the latitude and longitude of the intersection of the parallel and meridian nearly completed, under the order of the United States commissioner, and, a short time after, a pyramidal monument of dressed stone was erected to mark its position. At this point Mr. Jimenez and myself again commenced operations, on the 26th of June, to trace and mark the azimuth line running westward. By this time there were some indications of the commencement of the rainy reason, for which we had been anxiously waiting. At any other period of the year it would have been impossible to attempt this section of the work,

as there is little or no permanent water in the neighborhood of or along the whole length of this line of two hundred and thirty-seven miles.

Whilst the work was progressing, Lieut. Patterson moved with the escort and train from Tucson, via Tubac and Sopori, to Aribaca. Ojo del Agua de Sopori is a spring, twelve miles from Tubac, in a westerly direction; it once irrigated the valley of the same name, which was cultivated by Mexicans. We found a solitary peach tree, loaded with fruit, and signs of acequias, relics of other days. The stream is a small and pretty one. A league from it, in the Sierra Atascosa, rich mines of copper, silver, and gold, are said to exist. Its mineral resources have not yet been thoroughly examined, on account of the Apache Indians. Only the night before reaching "Sopori," a large party of them passed within a short distance of our camp, driving before them a drove of horses and mules. Within a day's ride of Tubac, through the "Sonora Pass," they have large herds of these, together with cattle and milch cows.

Eighteen miles and a half from "Sopori" (an Indian name) you reach a deserted Mexican rancho, in the valley of Aribaca; the latter is narrow, lying east and west, and bounded by high granite hills, limited on the east by the Sierra del Pais. These are all said to be rich in mineral wealth. Within four miles, and south of the deserted rancho, are to be found large excavations made by men previously engaged in mining; piles of metallic ore lay near the springs where they had been engaged in smelting.

The valley was mantled with rich green pasturage; immediately bordering it are hills covered with fine grama grass and a low growth of mezquite. Numerous springs lie concealed among the tule, with here and there a willow or a cotton-wood to mark their localities. A mule trail runs south from this place to Tubutama, a small town in Sonora, crossing the line about thirteen miles from Aribaca, and within four miles of the "Ojos Escondidos," lying at the base of the sierra of that name. To the northwest is a range of mountains crowned with a high peak of solid rock, called by the Papago Indians "Baboquivari," or "Water on the Mountain;" in winter it is covered with snow and ice, although at its base lies the "Tierra Caliente." It is a most prominent and unmistakeable land-mark, and during the triangulation of the line was of the greatest service, as it could be seen from different points more than one hundred miles apart.

The main escort and train remained in camp at Aribaca until near the middle of August. A few men, under Mr. C. Michler, were sent west to Sonoyta with supplies to re-provision the party on the line, and to make a reconnoissance of the road made by the wagons from Tubac to that place. Lieutenant Closson, with twelve men, formed their escort. Mr. Jiminez and Mr. Alemán accompanied them, for the purpose of going to Quitobaquita to establish its astronomical position, according to agreement entered into with the United States commissioner.

The sierras to the west were reported to be detached, and not continuous, so that, by winding around their bases, a good, although circuitous wagon road might be found; between them are generally broad and level valleys. The heavy rains in that direction offered great hopes of an abundance of water on the road.

Having shown the movements of the different parties, I return to the party on the line. This was necessarily very small on account of the anticipated scarcity of water. To reduce as much as possible the size of the pack-train, there were no more men employed than were absolutely necessary to do the work, without any regard to protection or defence against the Indians.

Leaving the "Potrero" in the valley of Los Nogales, where my party had been encamped for a few days, we started for the monument at the intersection of the parallel 31° 20′, and the

111th meridian. Our trail led up a pretty little valley towards the west for eight miles, when we reached the base of the "Sierra de los Pajaritos" (the Mountain of Little Birds;) following up one of the arroyos or gullies of this chain, we were soon locked in on all sides by high hills; the ravine through which we continued to wind for four miles became rocky, narrow, and difficult to pass, until we reached some small springs, "Los Ojos de Alizos." At this point we left the arroyo, and by clambering up a steep ascent gained the crest of the hills; riding or walking along it as best we could, and passing from hill to hill, each higher as we advanced, we finally reached the point where the monument stands. The hill on the side of which it is erected is low compared to the high peaks in its immediate vicinity; its locality is not easily discovered. Our instrument being placed in position, the azimuth of the new line (69° 19′ 45.9″ northwest) was measured from a meridian established by assistant Clark; a large live-oak growing on the adjoining ridge was found to be in the direction of the line, and answered the purpose of a monument, (No. XIX from the Rio Colorado.) Señor A. Diaz, with a party, operated conjointly with us in the prolongation of this line.

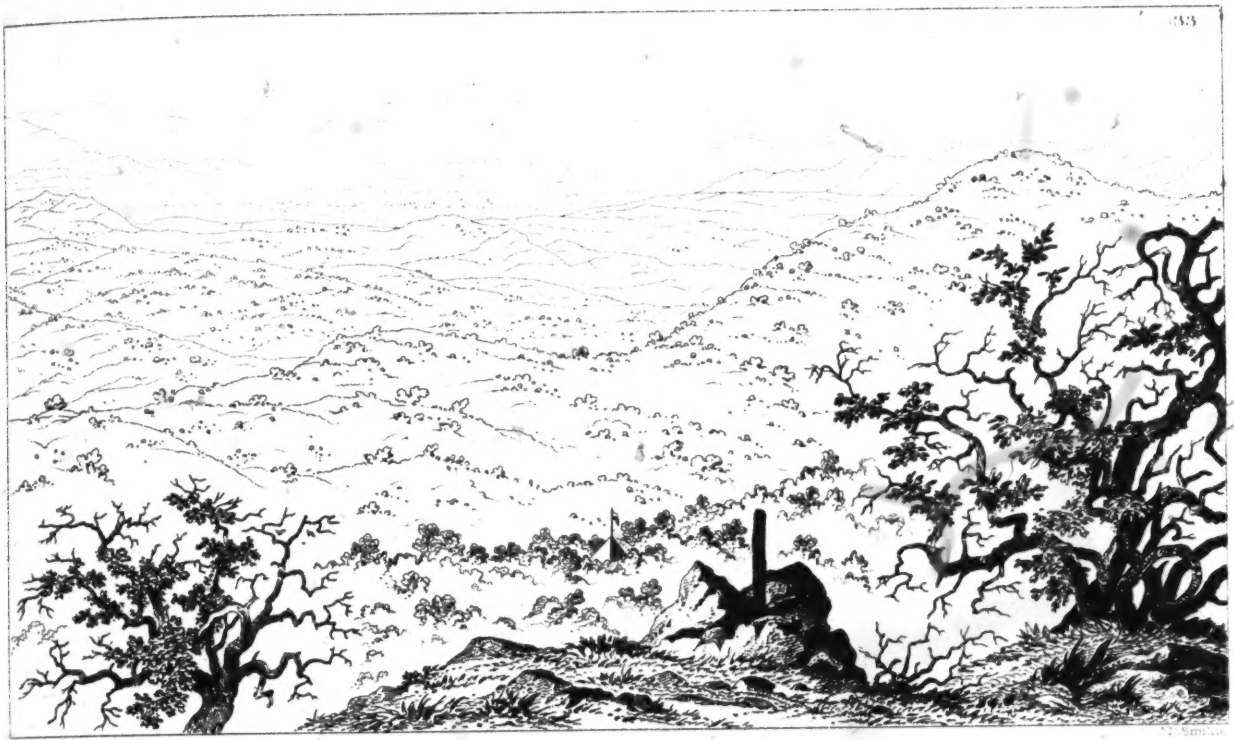
As if in response to our earnest wishes for rain, to be able to continue the work, we had scarcely commenced our labors before the heavens poured down refreshing showers, which we saw with pleasure extended along the line. The commencement of the rainy season is in reality the beginning of spring. The vegetation during the actual months of spring and summer is so parched by the excessively hot suns, that the country present the same appearance as is produced by the effects of frost in our more northern climates. The seeds seem to rest in the earlier part of the season, in order to germinate and beautify the autumn and winter.

"The Sierra de los Pajaritos" is said to form part of the Arizone mountains, reported to be the richest in Mexico. Many specimens of copper, gold and silver are found on the surface, and they are no doubt rich in ore. The hills are covered with live-oak trees, and are overspread with a rich growth of grama grass; they are capped by masses of conglomerate rocks. Monument XVIII, distant from XIX, a little over three miles, is situated on the same sierra.

The country here presents a new aspect. Powerful volcanic irruptions have at some earlier period of the world's history produced great disturbances in this part of the earth. Strata of limestone once horizontal, are now curved and bent by the force of this action, and masses of igneous rocks have been upheaved through the fissures opened on the surface. Here you find granite rocks, and near them beds of trap; and not far from both, limestone; then again all fused in one conglomeration. It was impossible to approach the station nearer than three miles with the riding and pack mules; the instruments had to be transported by hand for that distance up a rugged hill covered with vesicular and scoriaceous rocks.

Monument XVII is placed on the "Sierra de Sonora," seventeen miles from XVIII. Three days were occupied in travelling this short distance. The trail for the first two was over almost impassable mountains; massive rocks and steep precipices constantly impeded the progress of and turned the party out of its course, making the route circuitous as well as hazardous; rough ascents were surmounted, steep ravines followed down, and deep gullies passed; the mules had actually to be dragged along.

At the end of the second day the party found some small springs—"Los Ojos Escondidos"—on the trail to Tubutama, and encamped on them. On the third, the trail was still over high hills, but not so difficult; and some springs—"Los Ojos de Granizo"—a short distance from the monument, were reached. The animals had become so injured and lame by the sharp angular rocks, that they had to be taken into Aribaca to be reshod, and many of them to be replaced by others.



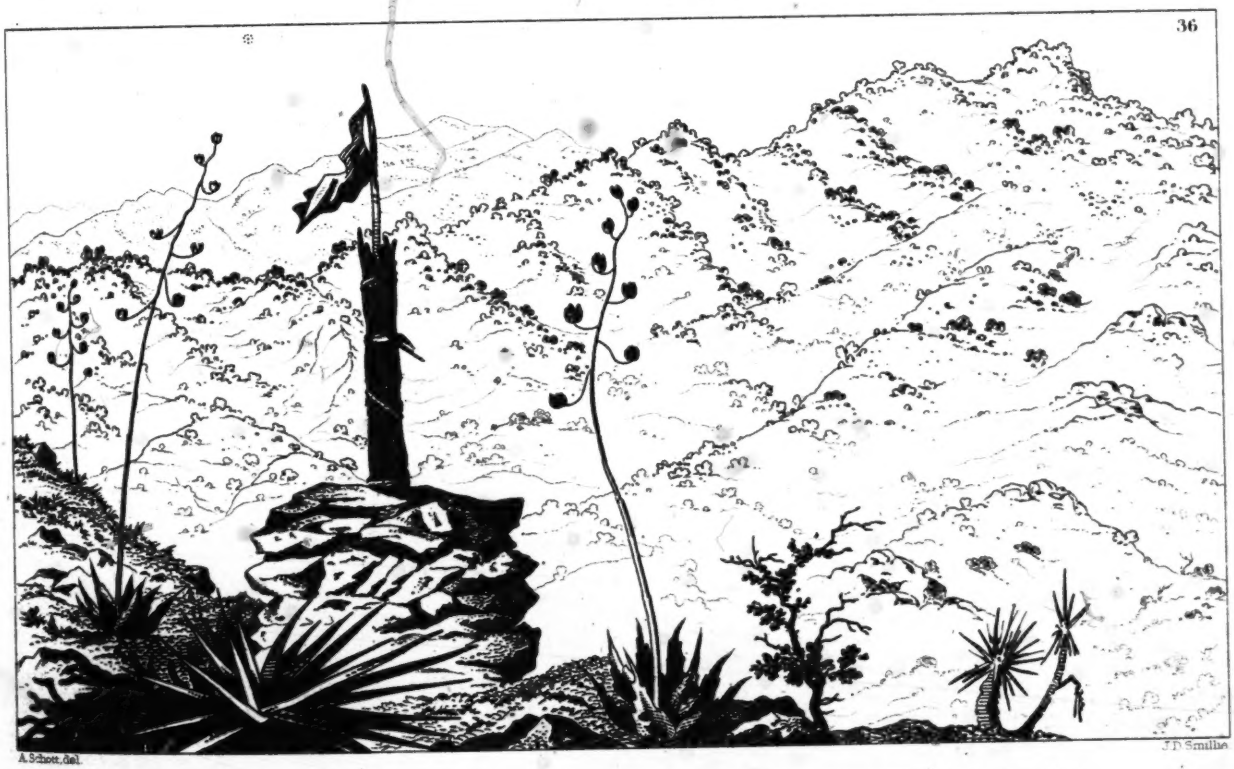
A Schott del. J.D. Smillie

VIEW FROM MONUMENT N° XIX, ON THE SIERRA DEL PAJARITO, LOOKING EAST TOWARDS THE MONUMENT, AT THE INTERSECTION OF 111TH MERIDIAN AND PARALLEL 31°.30' NORTH

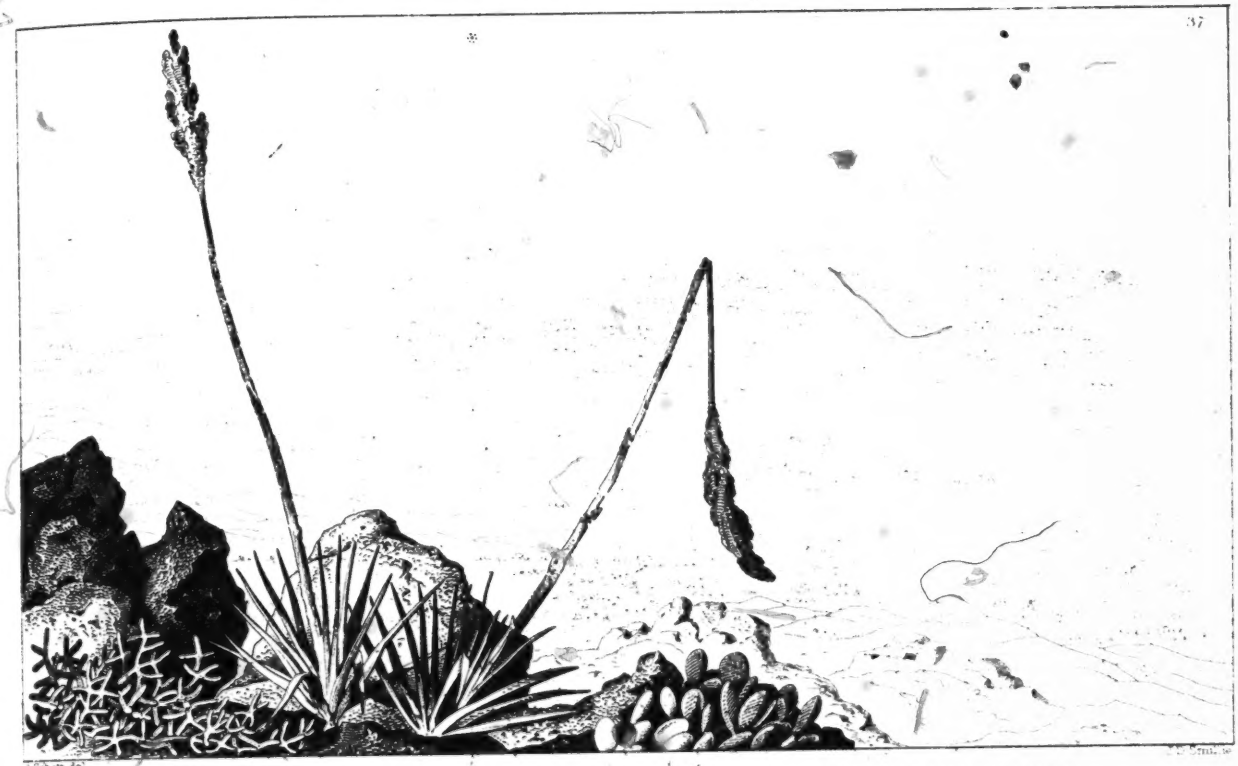
A Schott, del. J.D. Smillie

VIEW FROM MONUMENT N° XIX, LOOKING WEST TOWARDS MONUMENT N° XVIII, IN THE PUERTO DE LA SIERRA DEL PAJARITO.

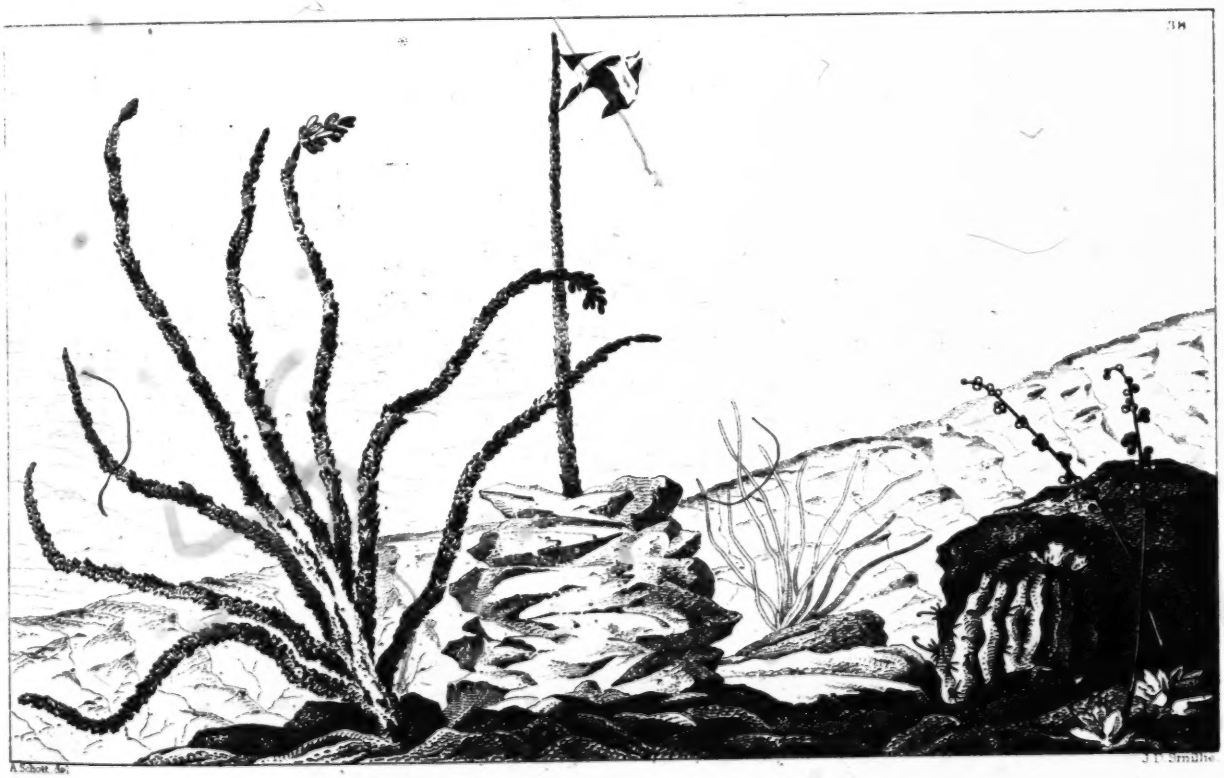
VIEW FROM MONUMENT XVIII. IN THE PUERTO DE LA SIERRA DEL PAJARITO, LOOKING WEST TOWARDS MONUMENT XVII. ON THE CERRO DE SONORA



VIEW FROM MONUMENT XVIII. IN THE PUERTO DE LA SIERRA DEL PAJARITO, LOOKING EAST TOWARDS MONUMENT XIX.



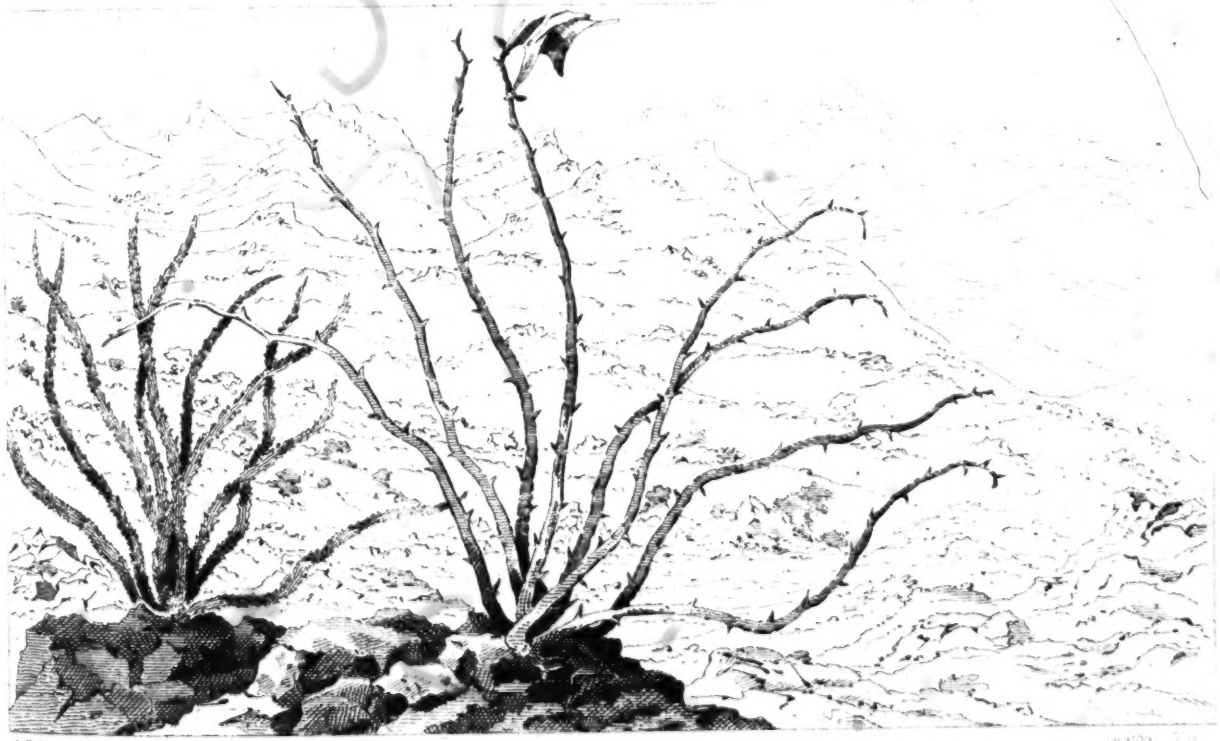
VIEW FROM MONUMENT Nº XVII ON THE CERRO DE SONORA LOOKING WEST TOWARDS MONUMENT Nº XV ON THE SIERRA DEL FUEGO VERDE



VIEW FROM MONUMENT Nº XVII LOOKING EAST TOWARDS MONUMENT Nº XVIII

A Schott Del.

VIEW FROM LINE ¼ MILE WEST OF MONUMENT № XVII LOOKING N.W. TOWARDS [illegible]

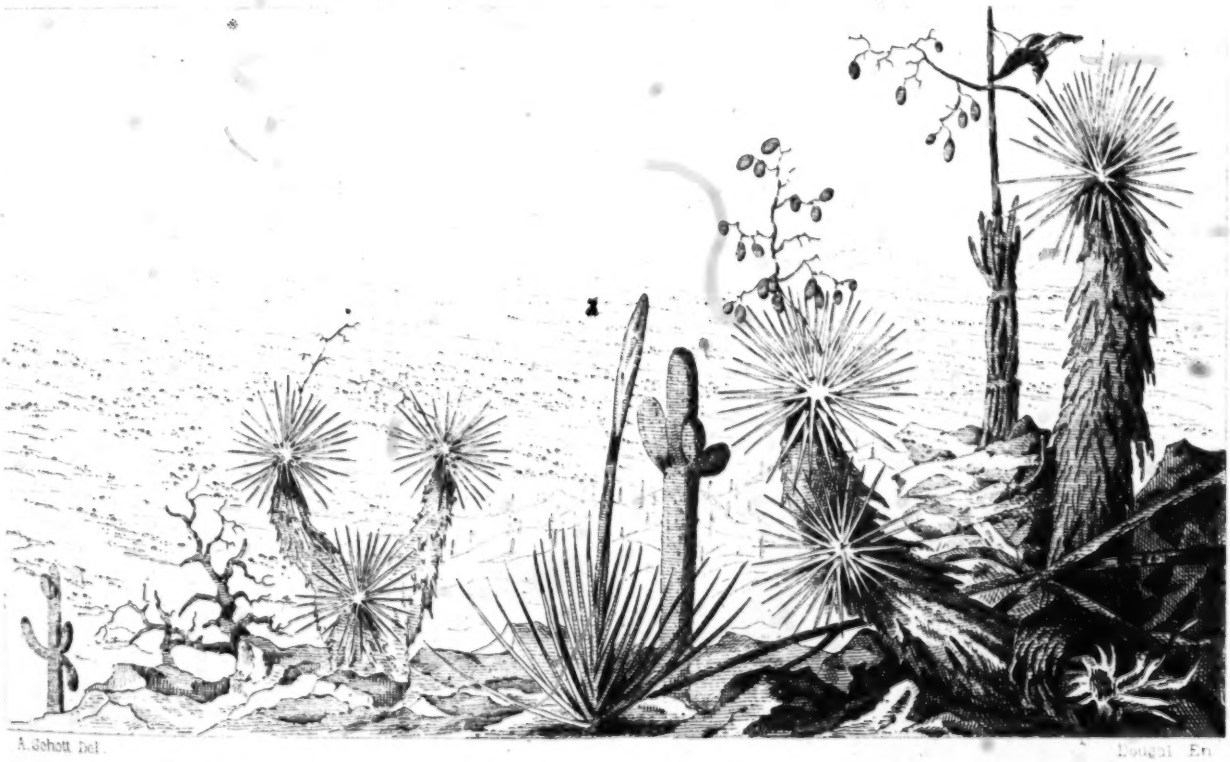


A Schott Del.

VIEW FROM MONUMENT № XVI LOOKING S.E. TOWARDS [illegible]

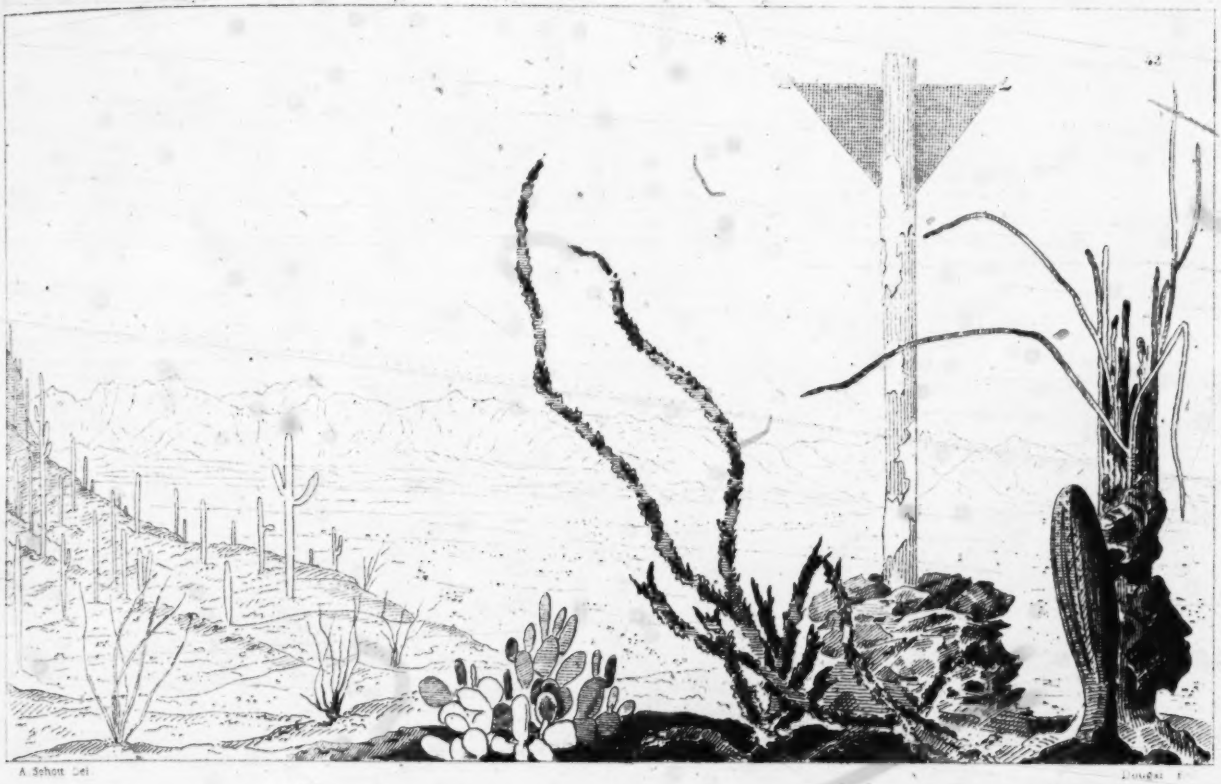
A. Schott Del. [illegible] Lith.

VIEW FROM MONUMENT No XV [illegible] SIERRA VERDE LOOKING EAST TOWARDS MONUMENTS XVI XVII & XVIII



A. Schott Del. Dougal Lith.

VIEW FROM MONUMENT No XV LOOKING WEST TOWARDS MONUMENT No XIV.

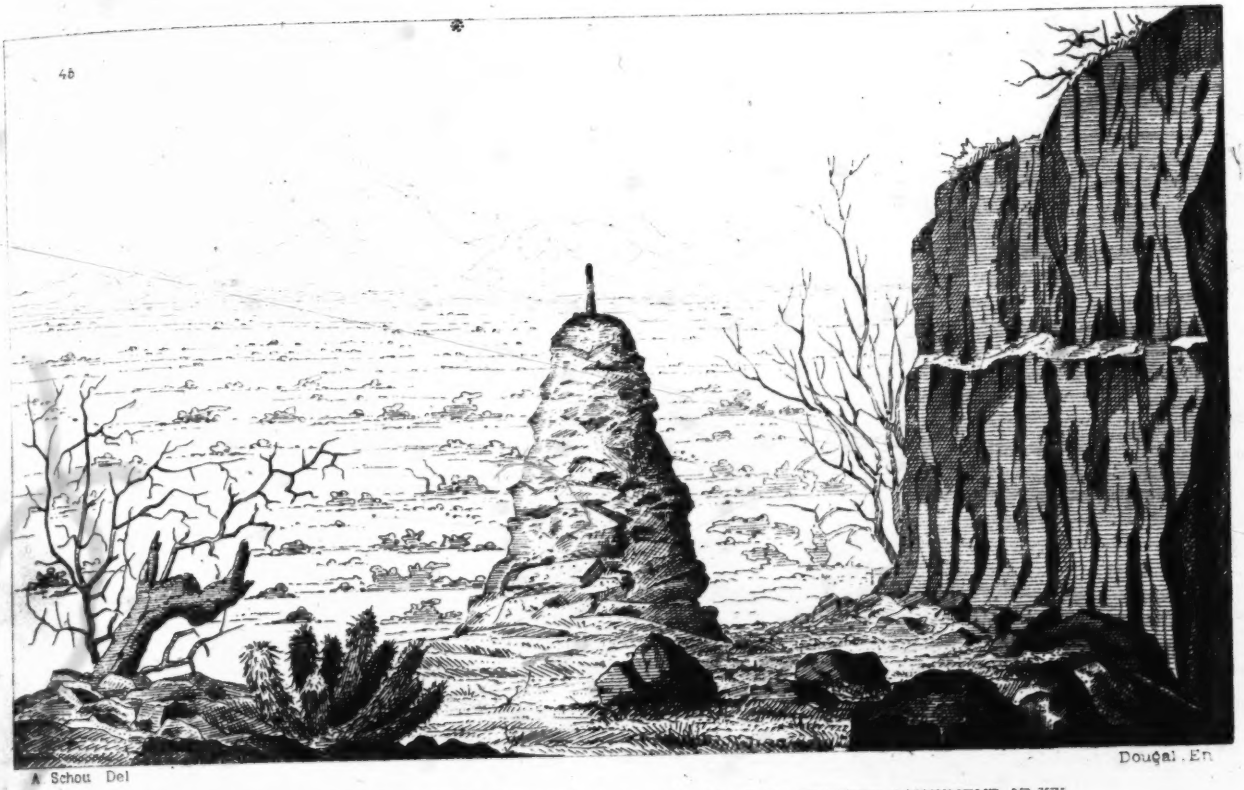


A. Schott Del. Lith. Eur.

VIEW, FROM MONUMENT Nº XIV ON THE SIERRA DE LA UNION LOOKING EAST TOWARDS MONUMENT Nº XV.

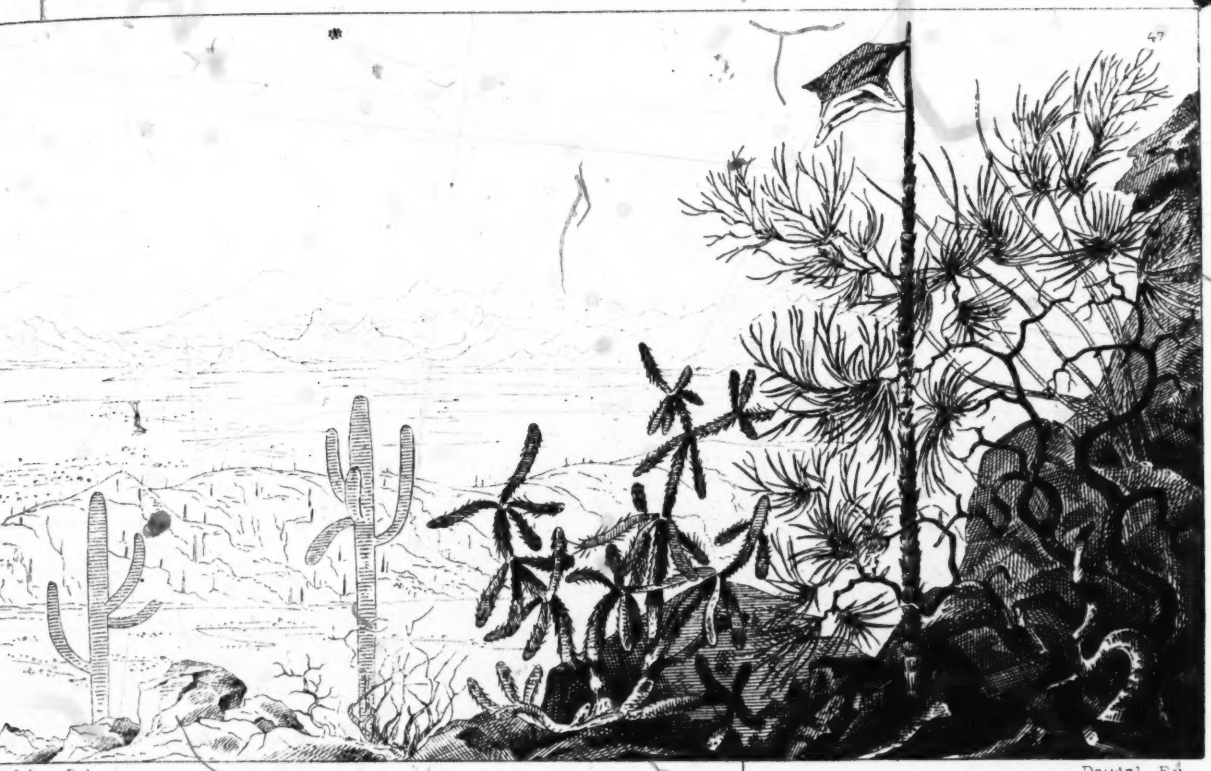
A. Schott Del. Lith. Eur.

VIEW FROM MONUMENT Nº XIV. LOOKING WEST TOWARDS MONUMENT Nº XI.



VIEW FROM MONUMENT Nº XIII NEAR SIERRA DE COBOTA, LOOKING EAST TOWARDS MONUMENT Nº XIV

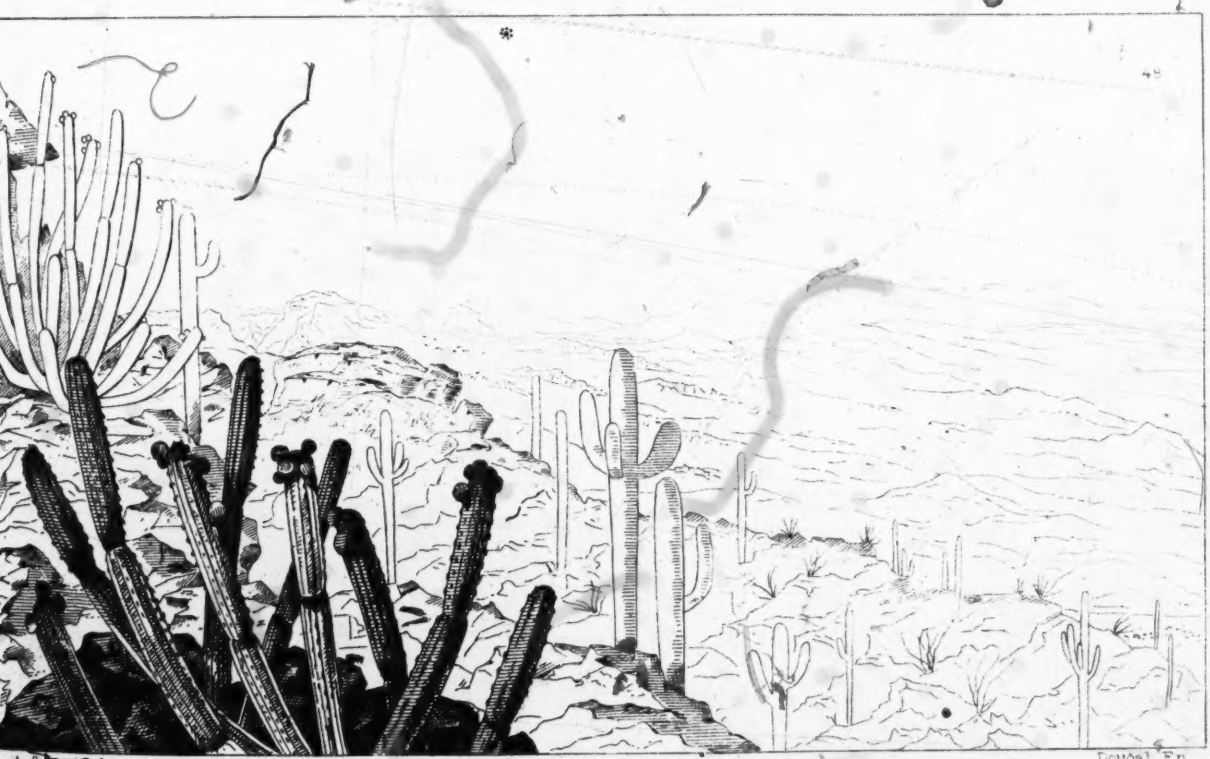
VIEW FROM MONUMENT Nº XIII LOOKING WEST TOWARDS MONUMENT Nº XII



A. Schott Del

Dougal Er

VIEW FROM MONUMENT Nº XII ON THE EAST RIDGE OF SIERRA DE LA NARIZ, LOOKING EAST TOWARDS MONUMENT Nº XIV



A. Schott Del

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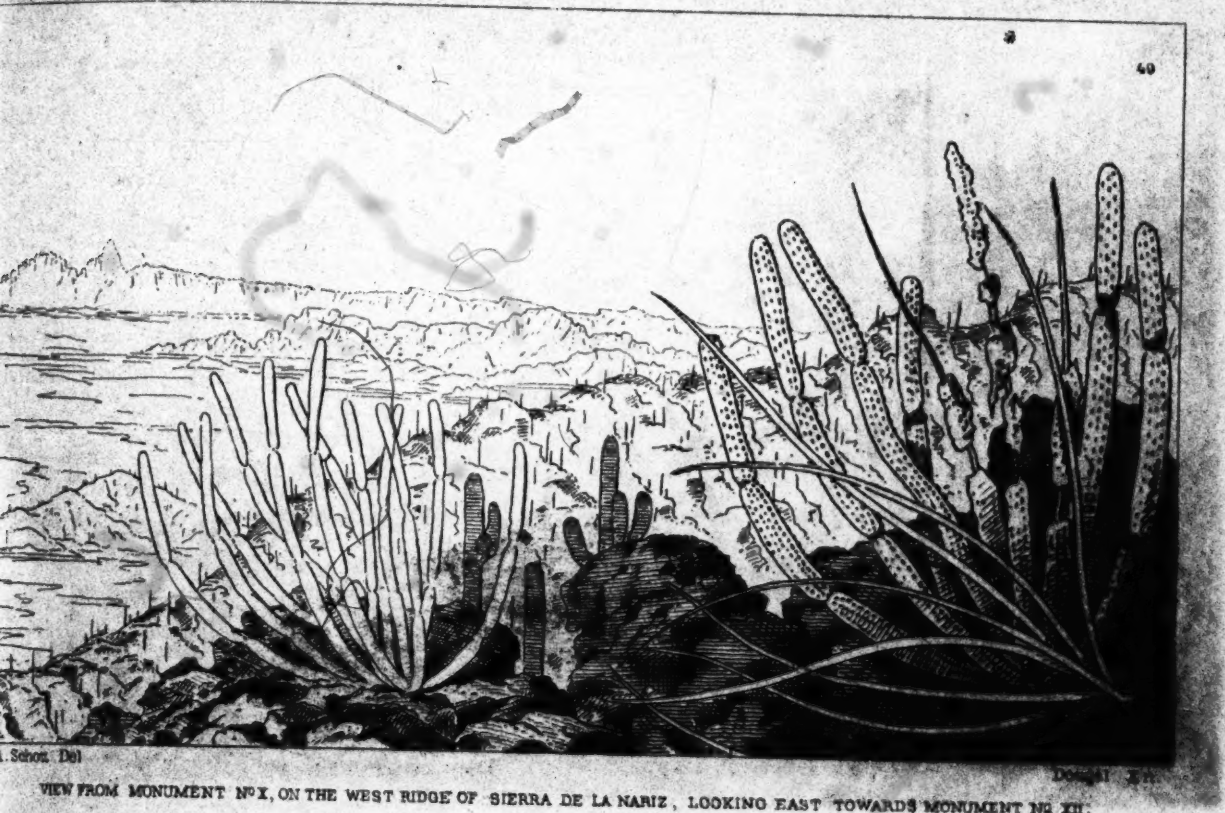
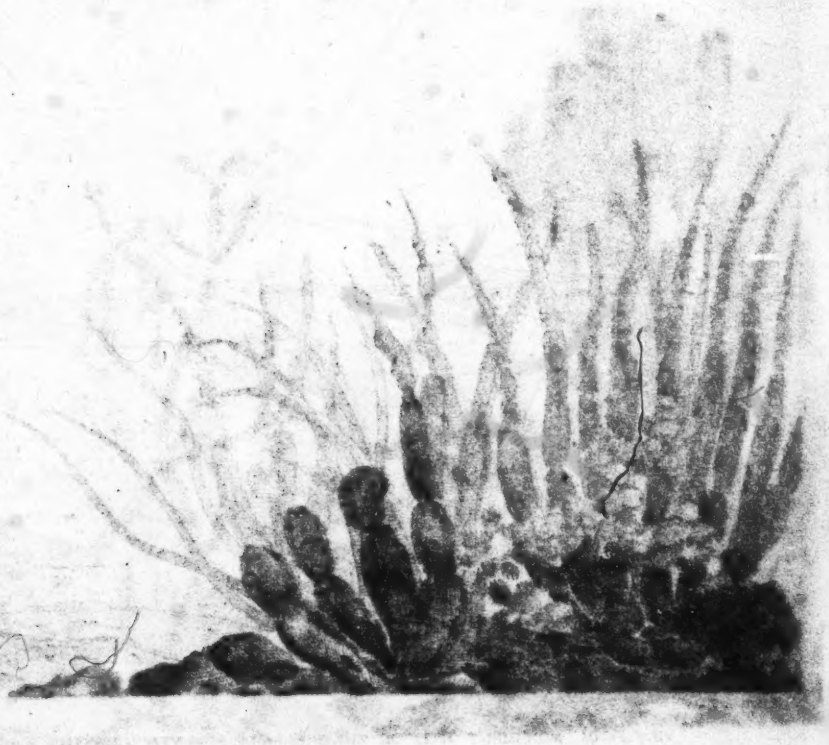
VIEW FROM MONUMENT Nº XII LOOKING WEST TOWARDS MONUMENT Nº X



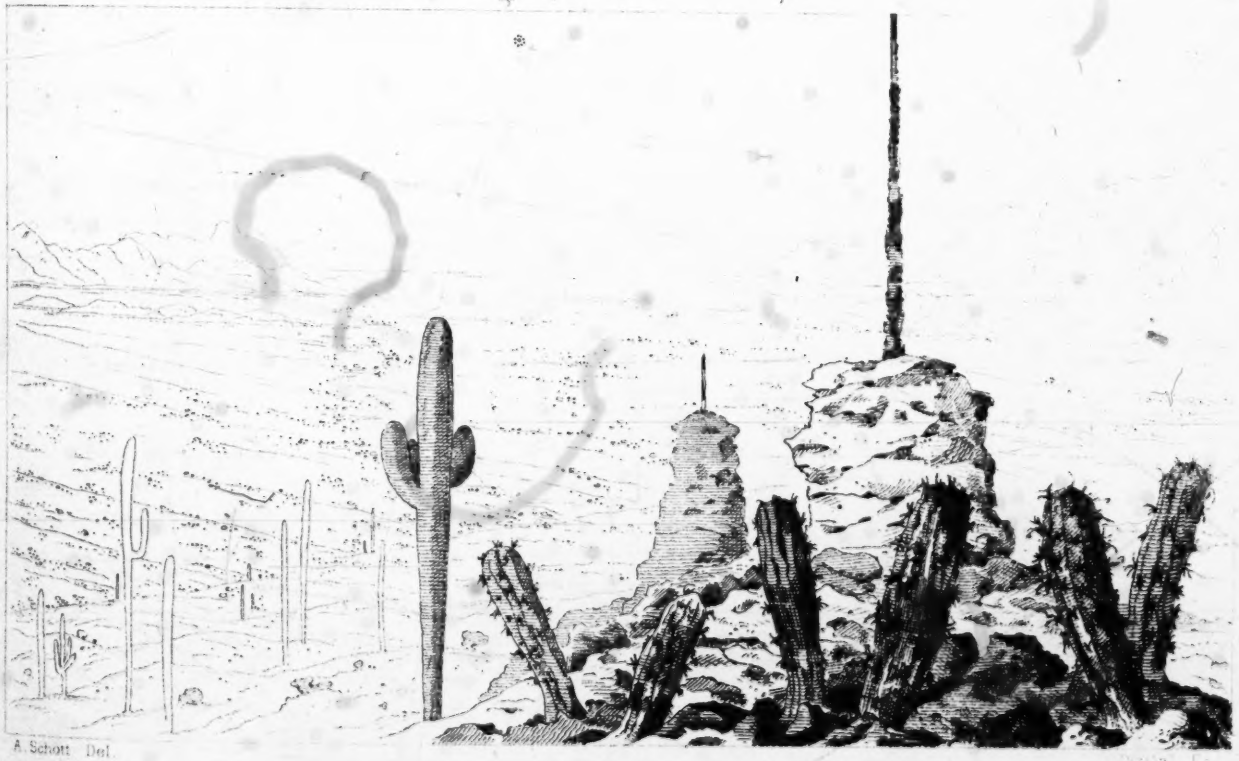
VIEW FROM MONUMENT Nº X, ON THE WEST RIDGE OF SIERRA DE LA NARIZ, LOOKING EAST TOWARDS MONUMENT Nº XII.

VIEW FROM MONUMENT Nº X, LOOKING WEST TOWARDS MONUMENT Nº IX.



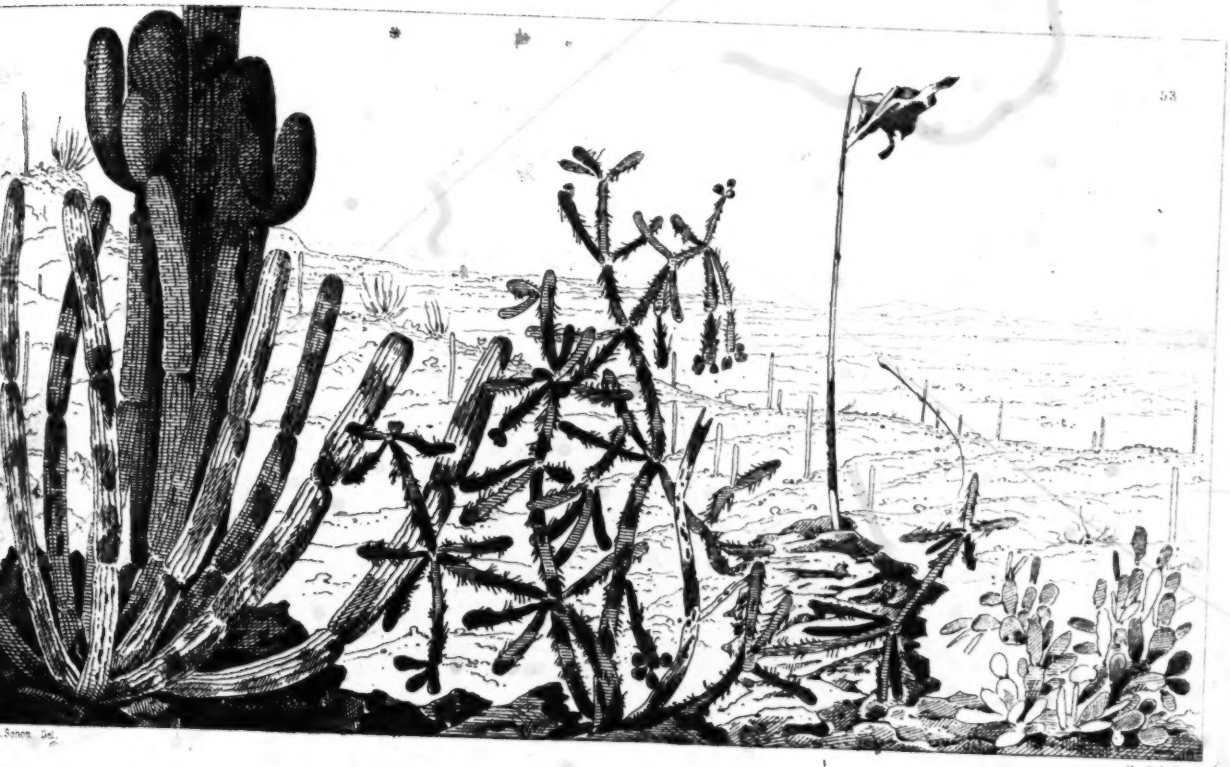
A. Schott Del.

VIEW FROM MONUMENT Nº IX, ON THE SIERRA DE SONOYTA, LOOKING EAST TOWARDS MONUMENT [illegible]



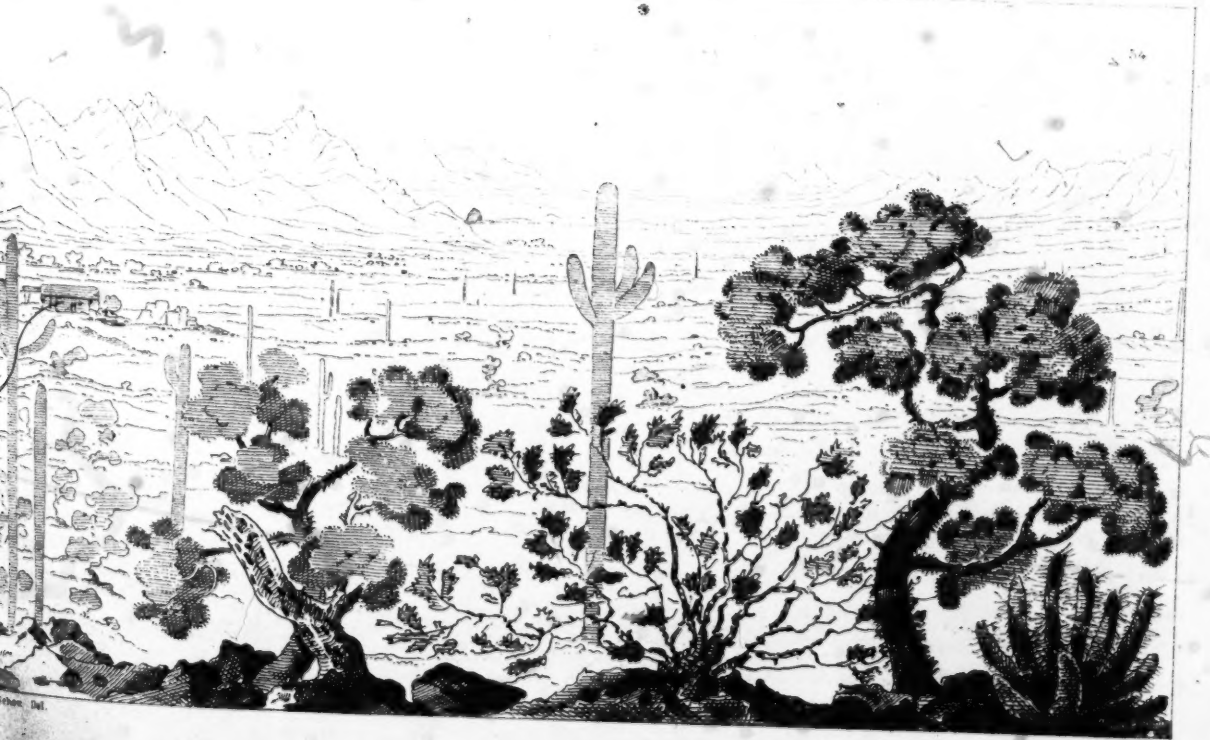
A. Schott Del.

VIEW FROM MONUMENT Nº IX, LOOKING WEST TOWARDS MONUMENTS [illegible]



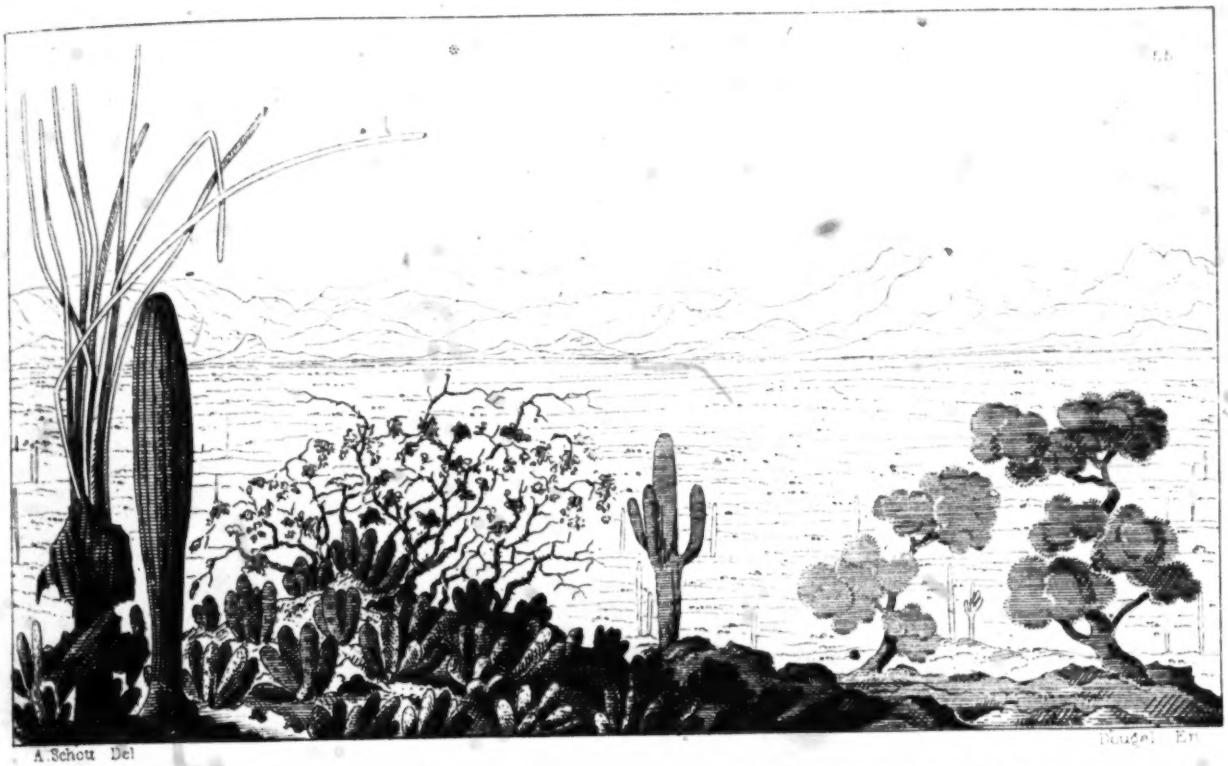
Dougal Ex.

VIEW FROM MONUMENT Nº VII, NEAR 'LOS OJOS DE QUITOBAQUITA', LOOKING EAST TOWARDS MONUMENT Nº IX.



Dougal Ex.

VIEW FROM MONUMENT Nº VIII, LOOKING WEST TOWARDS MONUMENTS Nºs VII & VI.



A. Schott Del

Dougal Et.

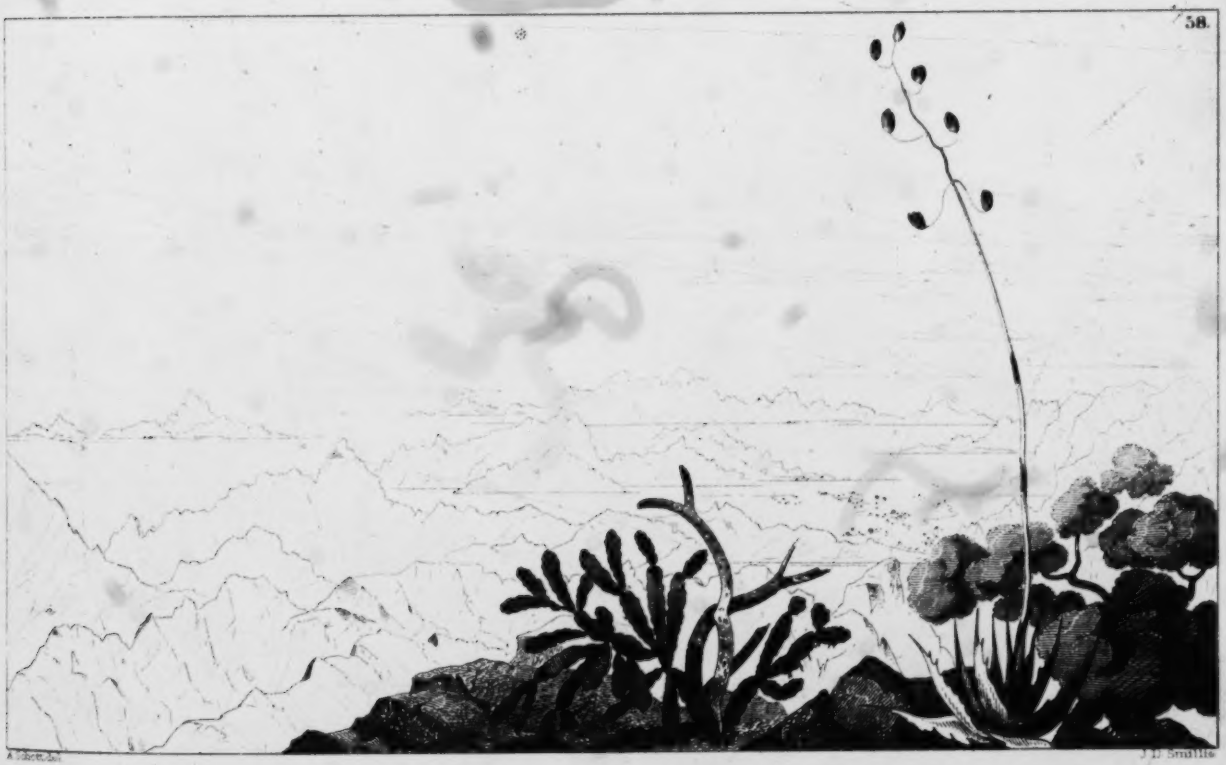
VIEW FROM MONUMENT Nº VI, ON THE CUCHILLA DE LAS CHOYAS, LOOKING EAST TOWARDS MONUMENT Nº IX

A. Schott Del

Dougal Et.

VIEW FROM MONUMENT Nº VI, LOOKING WEST TOWARDS MONUMENT Nº V

VIEW FROM MONUMENT N° V ON THE SIERRA DEL TULE LOOKING WEST TOWARDS MONUMENT N° IV



VIEW FROM MONUMENT N° V LOOKING EAST TOWARDS MONUMENT N° VI

59

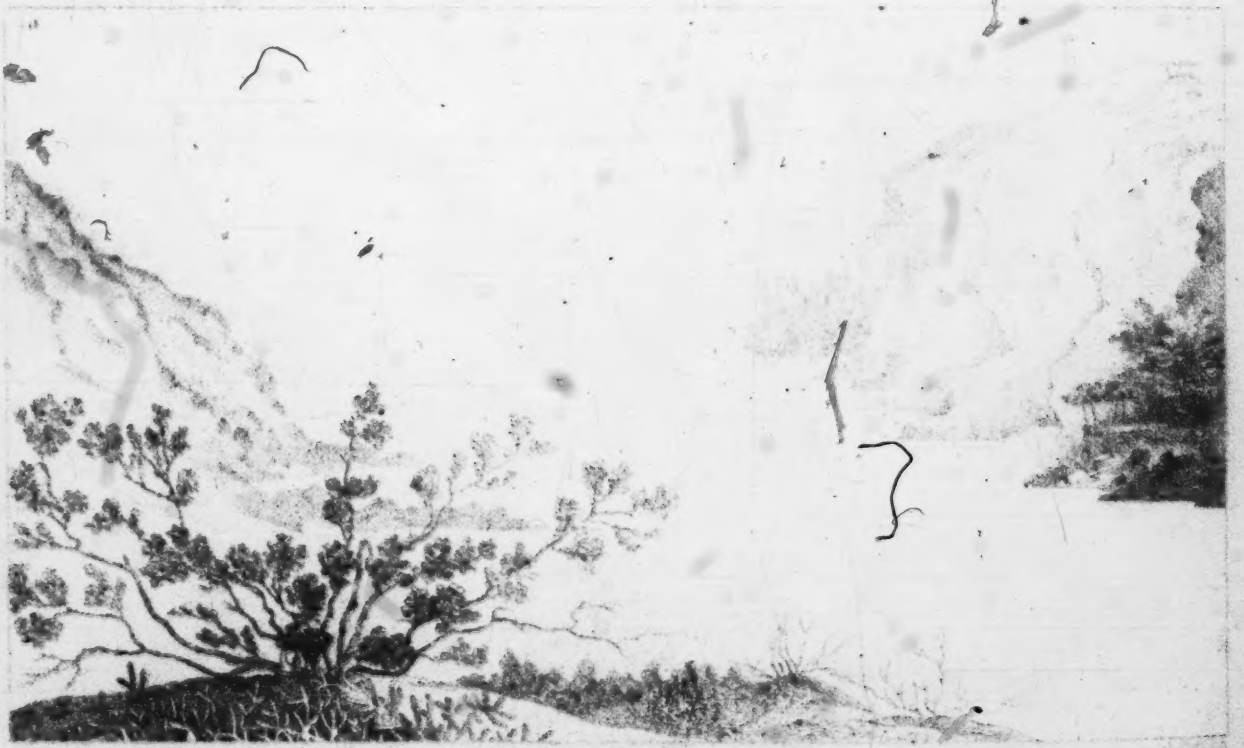
VIEW FROM MONUMENT N° IV ON THE SIERRA DE LAS TINAJAS ALTAS LOOKING EAST TOWARDS MONUMENT N° V

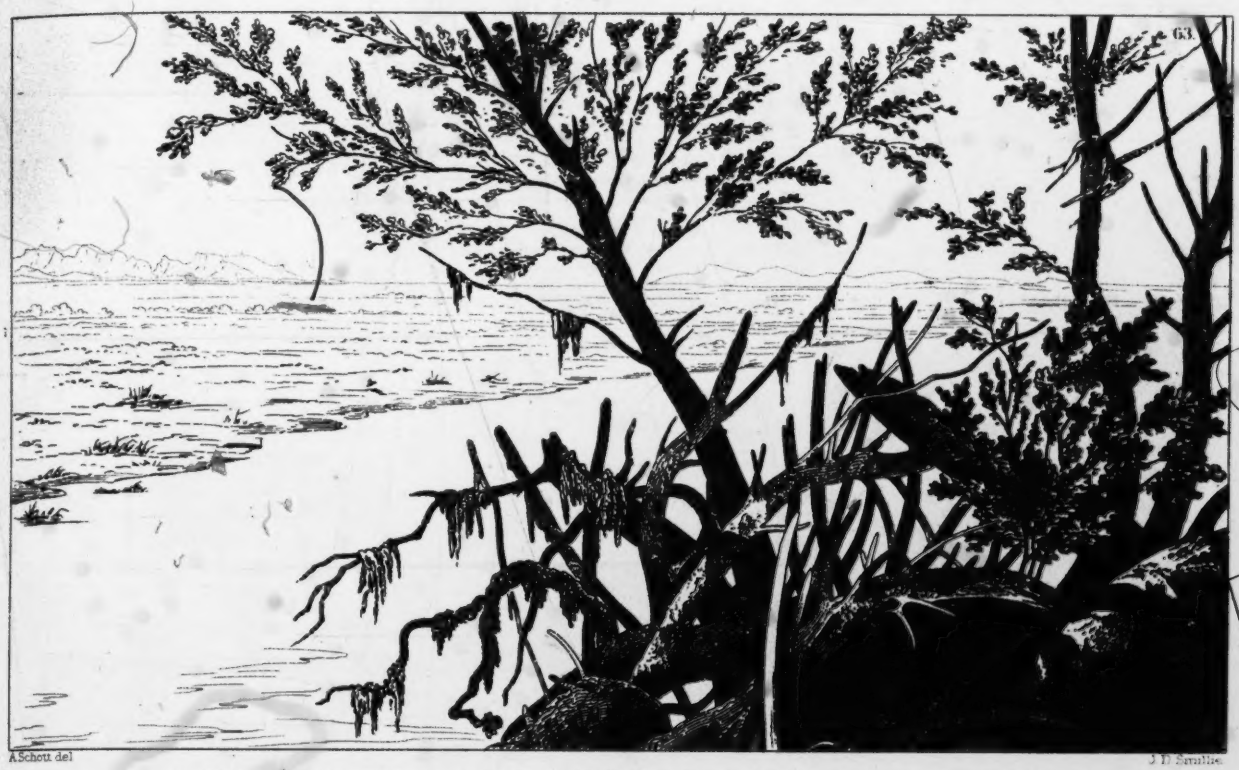
60

VIEW FROM MONUMENT N° IV LOOKING WEST TOWARDS MONUMENT N° III

VIEW FROM IRON MONUMENT Nº II. NEAR THE EDGE OF THE COLORADO DESERT LOOKING EAST TOWARDS MONUMENT Nº IV

VIEW FROM IRON MONUMENT Nº II. LOOKING SOUTH WEST TOWARDS THE CORDILLERAS OF LOWER CALIFORNIA.





VIEW FROM THE INITIAL POINT OF AZIMUTH LINE ON THE RIO COLORADO DEL OESTE LOOKING NORTH TOWARDS "AVIE-MIL-LI-KET" OR "SIERRA DE SAN PABLO"

VIEW FROM YUMA HILLS BELOW THE JUNCTION OF THE COLORADO AND GILA LOOKING EAST TOWARDS "SIERRA DE SAN PEDRO" OR "DOME MOUNTAIN"

A few feet south of the line is a prominent peak of the "Sierra de Sonora," which serves as a good natural object to mark it. A league from it are "Los Ojos de Granizo," (Springs of Hail;) their position is indicated by Monument XVI, erected on a hill two hundred metres to the north of them, as well as by some few willow and other trees. The soil is very rich in their neighborhood; the vegetation is profuse, and there is an abundance of fine grama grass; live-oak, and occasionally cedar, are seen on the hills. Whilst encamped here, heavy storms of wind, hail, and rain, were experienced; the valley where the party lay was so quickly flooded as to endanger all the camp equipage, as well as instruments; tents were blown down, and many articles carried away by the hurricane. Notwithstanding the inconvenience attending them, the rains were welcome, as they refreshed and cooled the atmosphere, which was oftentimes heated to 110° Fahrenheit. Some strange specimens of natural history were found at this place; among them, what is called by the Mexicans "El Scorpion," a large, slothful lizard, in shape a miniature alligator, marked with red, black, and white belts—a hideous-looking animal. The *alicante* and *coralilla* snakes were also caught, and added to the collection of natural history.

Leaving Los Ojos de Granizo, our trail lay over a wide and rich valley, running north and south, and extending along the east base of the "Sierra Babuquivari." Crossing it, brings you to the base of "Sierra del Pozo Verde," on which is erected Monument XV, a little more than nine miles from XVI. A trail leads round its southern extremity to Agua del Pozo Verde, (Green Well,) lying at the foot of the western slope, a little east of south, and about two miles distant from the monument. Permanent water is found here; and, although a large number of animals soon exhaust it, still it fills up in a very few hours. This is the site of an old rancheria of the Papago Indians. Numerous "metates" for grinding corn are lying about. The grave of one of their chiefs, who had been killed by the Apaches, was found near camp. A thousand arrows were buried with him, placed there as a token that his death would be avenged by his tribe. The Indians respect these graves, and the deadly threats which they contain, and will not remove a single arrow from the number, although it is a warning of hate and hostility.

The "Sierra del Pozo Verde" is very high, and overlooks wide valleys east and west of it. It is of granitic formation, and covered with a rich growth of grass, and plants of various kinds. The *suwarrow* grows on it in abundance; also the Fonquiera and many varieties of cacti, bearing beautiful flowers. The fruit of the suwarrow is delightful; it is shaped like the pomegranate, and when opened, presents the same beautiful carnation red; the seeds are very small and numerous, and of a black color; only the pulp and seeds are eaten. The Pimos and Papagos use it for food; also a small white cactus, which just peeps above the ground. Many antelope were seen about this place. The glare of our fires attracted a large number of rattlesnakes; the whole place seemed infested with them. We judged them to be a new species from their tiger-colored skins; they were exceedingly fierce and venomous. On the deserts of the Colorado we had often seen others with horns, or small protuberances above the eyes; and Dr. Abbott had taken from the body of still another species quite a number of small ones, among which was a monstrosity with two perfectly formed heads attached to one neck. When you lie down on your blankets, stretched on the ground, you know not what strange bedfellow you may have when you awake in the morning. My servant insisted upon encircling my bed with a reata of horse-hair to protect me from their intrusions. Snakes are said to have a perfect repugnance to being pricked by the extremities of the hair. The paisano, or

chapparal cock, surrounds his antagonist, while asleep, with a chain of cactus thorns; when the preparations are all made the bird flutters over the head of the snake to arouse it to action; the latter, in its vain efforts to escape, is irritated to such a degree, by running against the barrier encompassing it, that it ends its existence by burying its fangs in its own body.

From Sierra del Pozo Verde we moved on to Monument XIV, on the "Sierra de la Union," sixteen miles and a half from the last. The country between the two sierras was, as usual, a broad plain; but there is a great contrast between the east and west portions; the first seven miles were exceedingly rich, and covered with a fine growth of mezquite grass and underbrush, but the remainder of the distance was entirely bare of any kind of vegetation until we reached the base of the mountains, where we found the usual growth of palo verde, palo de fierro, cacti, &c. The bleached appearance of the soil, together with the excessive heat of the sun, reminded us of the Colorado desert.

The sierra is of igneous origin, with a considerable mixture of lime. Its western slope, instead of having the arid and desolate appearance of the eastern one, was fresh and green. Crossing it, we encamped at its base, near "Los Ojos de Yestas."

The next monument, XIII, is placed at the point of intersection of the line and the road made by the few wagons previously sent to Sonoyta, and not far distant from the "Papago Rancheria de Cobota." It is 11.8 miles from Monument XIV, and stands in a valley, limited by the Sierra de la Union and the "Cerritos de los Linderos." The boundary runs a few feet south of a high peak of the former, and between two prominent horns of the latter, both positions making good natural points of reference. This valley resembles the last in every respect. A deep gap in the mountain, near the Cerritos, affords a good pass, and the trail then goes out upon a broad plain, bounded on the west by the "Sierra de la Nariz," (Mountain of the Nose.) This plain is nearly level, and covered with low mezquite, and a few withered plants; its white surface, perfectly destitute of grass or of any verdure, gives it a dismal appearance. There is no water except in charcos, or ponds, filled by drainage after heavy rains. The same description answers for the country west of the Sierra de la Nariz, in the prolongation of the line, until you strike the valley of Sonoyta. Monuments were erected along this portion of the boundary, as follows:

No. XII, on the east ridge of Sierra de la Nariz; No. X, on the west ridge; and No. XI, on the wagon road made by our supply train, passing along the narrow valley between the two; from XIII to XII is 27.70 miles; XII to X, 4.3 miles.

These mountains are masses of black igneous rock, and difficult to clamber up. The eastern slopes are gradual, but the western are perpendicular ledges.

Monument No. IX stands on the Sierra de Sonoyta, 14.5 miles from X, and about one mile and a half north from the town of Sonoyta.

We found encamped near Sonoyta, the small party sent forward with provisions. Their road had been a circuitous and a hard one. The sierras had proved disconnected, and running in parallel ridges from northwest to southeast, with small valleys between them. Not being able to pass with wagons through the rough gaps frequently occurring in the mountains, they managed to wind round the bases, which are short and abrupt. A westerly course was preserved as much as the nature of the country would permit. Only a few small springs were discovered, and but one large well, regularly walled in by the Indians at Cobota. Had it not been for the heavy showers which fell almost every day, it would have been impossible for the

Arthur Schott del.

Lith. of SARONY, MAJOR & KNAPP, New York.

PAPAGOS

Arthur Schott, del. Lith. of SARONY, MAJOR & KNAPP, New York.

ARENEÑOS.
(SUBTRIBE OF THE PAPAGOS.

party to have found sufficient water to supply their wants. At the time we reached there, Mr. Jimenez was engaged in observing for latitude and longitude at Quitobaquita.

The valley of Sonoyta is not very wide, but affords pasturage for large numbers of cattle. Numerous springs course through it for short distances, and then sink into subterraneous channels. These, together with the "Ojos Escondidos," "Pozo Verde," the well at Cobota, and the springs at Quitobaquita, furnish the only water on the line that can be relied upon; nor are these always sure, as experience taught us. There is no timber within several miles of the settlement; firewood has to be brought on the back of the patient *burro*.

The town of Sonoyta is the door of the State of Sonora, from the California side. It is a resort for smugglers, and a den for a number of low, abandoned Americans, who have been compelled to fly from justice. Some few Mexican rancheros had their cattle in the valley near by. It is a miserable poverty-stricken place, and contrasts strangely with the comparative comfort of an Indian village of Papagos within sight.

The Papagos wander over the country from San Javier as far west as the Tinajas Altas. They were at one time a formidable tribe, and waged unceasing war against the Mexicans. Having sustained repeated losses, they at length sought their God, who is said to dwell upon the high peak of Babuquivari, to ask his aid and countenance in their last grand fight with their enemies. They assembled their families and herds of horses and cattle within an amphitheatre enclosed by the mountain ridges, and battled it manfully for many days at its entrance; but their God could not turn the fate of war, and they suffered an overpowering defeat; since that time they have been quiet and peaceable.

We passed many deserted Papago rancherias; they are generally situated some distance from water, as there seems to be a superstition about living near it; the women, who do all the labor, have to bring it in ollas, or earthen vessels, a long way, bearing it on their heads; they are compelled to keep very large ones filled, which are sunk in the ground, and capable of holding a great many gallons. This tribe is comparatively well off in worldly goods; they plant and grow corn and wheat, and possess cattle, and many fine horses. Nature supplies them with numerous useful plants which grow spontaneously; from the suwarrow (Cereus Giganteus) and pitaya they make an excellent preserve by simply boiling the fruit down without sugar, and also a candy of the same material. They collect from a low bush growing wild, seeds called "Chie," which are coated with a gummy substance; placed in water these become partly dissolved, and make a cool and refreshing drink, a refreshment much needed in that warm country. The women are better dressed than most Indian women; they all wear skirts of manta or calico, covering the body from the hips down. They appear to be a good, quiet, and inoffensive tribe. A sub-tribe of the Papagos, called Areneños, live on the salt lakes near the Gulf of California, and principally subsist upon fish.

North of Sonoyta, and about forty miles distant, is a rugged serrated range of mountains called "Sierra del Ajo," represented to be rich in copper, gold and silver. A company was engaged in attempts at mining, but, from the scarcity of water, with little hopes of success. The great distance necessary to transport the ore on pack-mules before reaching navigation, will render their efforts futile and unprofitable.

The section west from Sonoyta to the Colorado has already been described. In August we were enabled to complete that portion of the work, and although engaged upon it during the wet season, barely sufficient water was to be had for our wants. The heat had become so great as to compel us to operate entirely with signal-fires by night. Monuments are placed near Quitobaquita, Agua

Dulce, Tule, and Tinajas Altas, to mark the boundary. The line runs a few feet south of the springs at Quitobaquita, north of Agua Dulce and Agua Salada, and south of the Tinajas del Tule and Tinajas Altas. The sierras on which these two last are located were troublesome to work on; their summits are so peaked as to make it difficult to find a place sufficiently large upon which to stand or place an instrument. Those who visited these stations to determine them, had to console themselves by sitting up all night after their work was done, as there was not sufficient space to stretch themselves out.

The big horn mountain goats frequent this region, and the noise of their horns as they butt them together in fight is often heard among the rocks.

Mr. Schott has made a large and interesting collection of botanical plants and of natural history, besides making careful examinations of the geology of the country; he has also taken the views of the scenery along the line, which accompany this report.

It was a happy day that witnessed the termination of the field-work. On the 25th of August both parties left Sonoyta for Altar, and thence via Santa Anna to Magdalena, in the State of Sonora. The tracing and marking and triangulation of the line having been completed, Mr. Jimenez and myself compared at this last place the data for fixing the respective distances between stations, and the positions of the prominent topographical features of the country.

The section marked "B," (see Astronomical and Geodetical work,) shows the results of calculations of the latitudes and longitudes of points in the triangulation made to determine the "azimuth line of twenty English miles," together with tables showing the lengths of iron rods, A and B, used for measuring the base line; tables for laying off the circumference of the circle having its centre at the junction of the Gila and Colorado, and radius of twenty miles; tabulation of results for the latitude of the initial point on the Colorado; astronomical determinations of positions on the azimuth line between the Colorado and 111th meridian; and distances between monuments. Tabulated distances along the routes in the neighborhood of the boundary line from the Pacific ocean to the Gulf of Mexico also accompany this report.

At Imuris, a few miles from Magdalena, we found Lieutenant Patterson, encamped with the escort and train, having left Aribaca in August, and reached there via Tubac and Los Nogales. When at this last place, the Apaches, splendidly mounted upon fine horses, made a descent upon his animals and endeavored to stampede them. Although the Indians, in war-dress and uttering unearthly yells, dashed up within fifteen feet of the mules, then in excellent condition and well-rested, still their efforts were unsuccessful.

At Imuris the parties of both commissions separated—the one to return to the city of Mexico, the other to cross the continent to the Gulf of Mexico, and thence to Washington city.

I take great pleasure in reporting to the commissioner the very agreeable relations, both official and social, which constantly existed during a difficult work, with those gentlemen of the Mexican commission with whom we were so long and intimately associated.

From Imuris we travelled the road up the San Ignacio river by Cocospera, a deserted mission, to the rancho de San Lazaro, where we struck the main southern emigrant road. If space permitted, I should like to dwell upon the rich valleys of the "Tierra Caliente" of Sonora, the towns of Altar, Santa Anna, Magdalena, Imuris, San Ignacio, and Cocospera, through which we journeyed on our way home; upon their highly cultivated fields of grain and sugar-cane, irrigated by miles of acequias, and their gardens loaded with richly flavored fruit of the tropics as well as of the more temperate zones. At Magdalena we saw in the same garden, apples, peaches, apricots, pomegranates, figs, grapes, lemons and oranges. Leaving San Lazaro, we followed the

road, via Santa Cruz, Janos, and Corralitos, to El Paso, and thence took the southern route through Texas to San Antonio de Bexar. From San Diego, on the Pacific ocean, via Fort Yuma, Tucson, Santa Cruz, Janos, El Paso, and San Antonio, to Indianola, on the Gulf of Mexico, measured by viameter, the distance is 1,727.32 miles. From San Diego, via Fort Yuma, Sonoyta, Altar, Imuris, Santa Cruz, Janos, El Paso, and San Antonio, to Indianola, the distance is 1,695.22 miles.*

My party arrived at this place November 30, 1855; a few days after, it was discharged, and the property belonging to the commission disposed of by sales. I reached Washington January 10, 1856.

To the officers of my escort, and to my assistants, I feel deeply indebted for their urbanity in all my companionship with them, and for their untiring efforts in the performance of their duties.

I am, sir, very respectfully, your obedient servant,

N. MICHLER,
Lieut. Corps Top. Engineers, U. S. Army.

Major W. H. EMORY, U. S. A.,
U. S. Commissioner.

RECONNOISSANCE TO THE MOUTH OF THE GILA RIVER, FROM SAN DIEGO, CALIFORNIA, SEPTEMBER 11 TO DECEMBER 10, 1849.—BY C. C. PARRY, M. D.

On the 11th September, 1849, the astronomical party of the United States boundary commission, detailed by Major W. H. Emory for the determination of the point of junction of the Gila and Colorado rivers, left the Mission San Diego, en route across the mountains.

A more direct course than that usually taken was concluded on, leading northeast by the Rancho Santa Monica, to intersect the road usually travelled at Santa Maria.

Soon after leaving the mission grounds, we commence the ascent of the first rocky range, leading by steep slopes to a height of several hundred feet above the river valley; thence, passing over upland terraced plains, to descend a broken slope on the opposite (eastern) side.

The rock exposures show a form of porphyritic greenstone, of close, compact texture, and uniform bluish color. As exposed in the line of the river course, which lies to our left, it exhibits abrupt broken walls, through which the river makes its way, forming, near its exit from the range, a distinct fall of ten or twelve feet in a distance of two hundred yards. At this point commences the line of irrigating ditch, which formerly supplied the cultivated grounds adjoining the Mission of San Diego, distant two miles or more. The only traces of this aqueduct now remaining consist of broken patches of masonry, seen at several points along the right bank of the stream.

This greenstone range, having an average width of two to five miles, terminates on the east in an open basin valley, bounded on its western aspect by granite rocks, whose grey, mottled appearance shows a marked contrast to the uniform bluish aspect of the porphyry range.

Our route thence, observing a general northeast course, passes diagonally over the wide basin-valley below, reaching, at a distance of twelve miles from the mission, the Rancho Santa Monica. This rancho occupies the left bank of the upper San Diego river, attached to which is a very considerable section of rich bottom-land, capable of irrigation. The higher lands, and mountain slopes adjoining, furnish the requisite pasture ground to extensive herds of cattle and

* The distance can be shortened and the road improved by following the line of Lieutenant Parke's exploration through the new territory. W. H. E.

horses. From this point, continuing a northeast course, the main stream of the San Diego river is crossed; thence you pass up a more northerly branch. On this route we soon approach an immense mountain wall, lying on our right, and blocking up our way eastward. The ascent of this was accomplished at a depressed point in the general range, leading by a rude, unbroken track along the edges of a ravine. The general height of the ridge, some eight hundred feet above the valley, was at last attained by doubling teams, and frequent manual assistance.

Our route thence led along, and beyond, the line of broken valleys and irregular ridges, showing frequently depressed basins, over upland plains, to the Rancho Santa Maria. The rock exposure was quite uniform, being composed of crystalline feldspathic granite, coarsely grained, or showing occasionally a close sienitic texture. The computed height of the Rancho Santa Maria, above the sea, is 1,353 feet. It occupies the western edge of an extensive upland plain, from which is distinctly visible towards the east, at a distance of fifteen to twenty miles, the broken line of the dividing ridge of this mountain range.

On the northern border of this plain lies the lower course of the Rio Santa Isabel, flowing hence in an irregular western course, and finally forming the San Diegito river, which empties into the ocean some twenty miles above San Diego. The open plain is destitute of timber, being covered mainly with pasture growth. The California live-oak (Quercus agrifolia) grows on all the adjoining mountain slopes. Continuing along the line of the main road to Santa Isabel, being the same followed by General Kearny in 1846, the day before the battle of San Pasqual, a gradually increasing elevation brings us in the midst of the attractive mountain scenery of this portion of California. We here pass amid groves of live-oak, verdant shrubbery, and rich pasturage, set off in the back-ground by high rocky cliffs, or disclosing, in the distance, pine-fringed heights, distinctly marked against the clear sky. At Santa Isabel we encounter a clear running stream, coursing through an open valley, surrounded by lofty mountains; those directly to the east form the dividing crest of the range.

From this point there is a "cut-off" leading by a direct east course, over the mountain ridge, which rejoins the wagon road at San Felipe. To this route, being least known, we shall confine our remarks. Passing then directly up the main course of the Rio Santa Isabel, we follow a plain bridle-path, which, passing by frequent ascents, at first steep and broken, amid rocky exposures of granite, soon expands into quite an open valley. This valley is bounded on either side by steep mountains, along the sides of which, as we proceed upwards, pines make their appearance. Our trail, crossing from one side to another of the lively brook dignified with the title of the Rio Santa Isabel, brings us into the main road, about six miles above the settlements, and near the dividing crest of the main ridge. Just below this is situated the rancho of a Mr. Williams. The country here has a fresh mountain look; the air is cool and bracing. The rock exposures at this point show a form of quartz granite, frequently imbedding crystals of tourmaline.

The view from the higher peaks in this vicinity, reaching probably a height of 5,000 feet or more above the sea, is strikingly grand. We here overlook, to the westward, the broken mountain ranges stretching in a dim line seaward; to the east the descent is more abrupt, and the view shows the bare outline of the desert mountains, projecting in irregular spurs into the desert plain, or standing as isolated ridges in the dull brown expanse below.

The descent from the ridge to the east is by abrupt pitches along the sides of a steep ravine, opening out below into a dry waterless valley; this valley, thence expanding, forms the open plain of San Felipe, surrounded by dull ashy-colored mountains.

The distance, by this pass, from Santa Isabel to San Felipe, is twelve miles, while the wagon road between these two points is twenty-five miles, or more, in length.

The geological formation exhibited along the eastern slope of the mountain range at this point shows a very sensible change, and in place of the usual forms of feldspathic or quartz granite we meet with a more prevalent character of micaceous granite, in which the scales of mica are frequently of large size, and very confusedly intermixed. With this also occur mica and talcose slates, traversed by quartz veins. At this point, then, we have an approach to the gold formation, and in the section of country thus limited, exist the fairest prospects of mineral discoveries.

The country thus characterized is, however, barren and desolate in the extreme; water is scarce, and pasturage of the poorest description. Thorny cacti and arid shrubbery usurp the soil, not only of the mountain clefts, but also of the open valleys. At this point, indeed, we may say, the desert proper commences; for it is here we have the first appearance of the desert plants *Larrea Mexicana* and *Fouquiera Splendens*.

On leaving the last rocky exposures to enter on the open desert plain, we pass some distance down the bed of Cariso creek; along the course of which are exposed the high bluffs of sand, marl, and clay, exhibiting a fine sectional view of the tertiary formation on which the desert plateau is based. At the point where the road leaves the bed of the creek, to mount to the desert table-land, some 150 feet above, fossil marine shells of *Ostrea* are found, and gypsum makes its appearance in extensive beds. The upper layer of the table-land shows a variable thickness, composed of water-worn pebbles, derived from the adjoining mountains. Near the mountain base, this plateau has a height of about 500 feet above the level of the Colorado river. The surface extends in a gentle slope towards the Colorado, or eastward, about the distance of twenty-five miles, where it reaches its lowest depression at the Lagoon or "New river" basin, which is in fact a part of the extended alluvial tracts belonging to the Colorado river.

The proof of this latter fact is seen in the barometric observations, showing a depression at this point, below the level of the Colorado river in high water, and also by tracing a direct connexion between the overflow of this latter stream and the appearance of water at New river. The numerous depressions found along the course of this alluvial tract have, moreover, all the character of the sedimentary soil of the Colorado bottoms, supporting, though more sparsely, the same character of vegetation, and showing, frequently, fluviatic shells, identical with those now found at lagoons and sloughs adjoining the river.

This "New river" tract also receives the drainage of a large scope of desert country, which is sometimes visited by heavy showers of rain. It retains this rain-water, and river overflows, for several months; when both these sources fail, it becomes a perfectly dry bed, or contracts into quaggy saline marshes.

When we stopped here, in the latter part of September, copious local rains had filled these lake reservoirs, which, with previous extensive river overflows, had enriched the soil and caused a rank growth of annual grama grass. This afforded a fine grazing camp for our animals for two months.

Directly south from our camp at this place, and about eight miles distant, lies a high mountain range, having a direction nearly east and west. To the western and most prominent point of this range the name of "Signal Mountain" was given. This range is made up of a form of sienitic rock, associated with recent lava. Its surface is bare, and presents a forbidding outline of dark weathered rock, variously marked by furrows, and shows an irregular crest, gradually sloping towards the east.

Our route hence to the Colorado river leaves this depressed alluvial tract to the south, and passes again over the hard, gravelly surface of the desert table-land till we come upon the regular wooded bottoms of the main river. These bottom-grounds are everywhere bounded by a distinct line of the desert table-land, which forms bluffs of greater or less height. The character of these bluffs is often obscured by drifting sand, which is constantly encroaching on the lower tracts.

Natural Section. East bank of the Colorado river below mouth of the Gila river. Length 600 yards.
A. Breccia of feldspathic granite. Height 50 feet above low-water mark.
B. Drift composed of fragments of the same, more rounded. The strata dipping on an angle of 35°.
CC. Old beds of Gila river below high-water mark.
D. Strata of sand, 40 feet high, with seams of harder character.
E. Layers of pebbles, 15 to 50 feet, corresponding to calcareous conglomerate forming the table-lands of the desert.
F. Line of high-water mark, 12 feet above G. Line of low-water mark.

This upper bottom-land is densely wooded with mezquite, which here finds its most congenial soil, and spreads its thorny branches on all sides, forming impenetrable thickets. To this higher level succeeds a lower surface of moist soil, supporting cotton-wood and willow, both of which extend to the immediate edges of the stream.

In passing up the river on its right bank to the junction of the Gila, we encounter a rocky ridge abutting directly on the river bank; thence rising inland into high rugged peaks, it forms the "Pilot Knob" range. The character of the rock, as exposed on the river bank, is *gneiss*, having a distinct laminated structure. This character gradually passes into a form of *sienite*, composing the principal mass of the adjoining mountain ridge.

The immediate junction of the Gila and Colorado rivers is marked by a formation different from any elsewhere noticed. It consists of rounded knolls, which rise from fifty to one hundred and fifty feet above the river level, and are strewn over with the erratic deposites belonging to the desert formation. Its internal structure is thus in a great measure concealed. In the cleft made by the passage of the Colorado, just below the junction, the central nucleus is brought to view, and exhibits a form of epidote rock, occurring as an irregular breccia, and showing evidence of internal disturbance below.

The Colorado river, below the junction, is barely five hundred feet across. The Gila, near its mouth, is one hundred and fifty feet wide. The depth of channel in each is very variable.

The alluvial delta lying north of the junction of these two rivers is considerably below high-water mark. It thus furnishes soil suitable for cultivation, and is occupied as such by the Yumas Indians. Some two miles above the junction, on the right bank of the Colorado, are marks of an old river bed, which, in the time of floods, is filled with an obstructed body of water, forming frequent sloughs and lagoons along its course. The

ground thus irrigated is occupied by another branch of the Yumas tribe for cultivation; the chief productions being maize, beans, pumpkins, and melons.

At the time of our arrival, in the month of October, it was the harvest season. The river overflows usually occur in the month of July. During the early part of the month of October the weather was oppressively sultry; the thermometer at mid-day frequently rising to 100° in the shade. The sky was remarkably clear, and the atmosphere extremely dry. During the month of November the air became sensibly cooler, especially at night; the thermometer sinking below 50° Fahrenheit. Heavy dews and fog at times, with cloudy weather and occasional showers, rendered the atmosphere more moist. Strong winds were frequent from the north, raising immense clouds of dust along the course of the river.

Natural Section. West bank of the Colorado river, opposite mouth of the Gila river. Height of B 70 feet.
A and B. Same as above.
C. Level of the Colorado bottom, 15 feet above water-mark.
D. Exposure of chlorite and talc, granulated, laminated, shooting up in the form of veins into the superincumbent mass.
E. Hills of the same character.
A being concealed by B.
F. High-water mark, 12 feet.

The water in the river channel varied but little during our stay, occasionally rising several inches, in consequence of heavy rains, and again sinking to the ordinary low-water level. Along the sides of the cañon, through which the river passes, below the junction of the Gila, there is plainly seen a line of high-water mark, showing an elevation of twelve feet or more above the usual level.

The character of the soil adjoining the river banks, derived from the sediment of river overflows and the light material borne by winds from the adjoining desert plateaux, causes along the bed of the stream the frequent formation of shifting sand-bars. These are perpetually changing with the variable river current. The process of deposition and removal is thus continually going on, rendering the river bed exceedingly variable and unequal in its depth and permanence.

The view of the adjoining country from any high elevation discloses a scene of unqualified barrenness and bleak sterility. The horizon is everywhere bounded by the bare outline of distant mountains, forming jagged and serrated ridges, or rising into various-shaped domes and chimney peaks. Intermediate, stretches the broad and desolate table-land, with its dead-brown aspect; while the more attractive river bottoms are seen clothed with a straggling growth of mezquite, or reflecting from turbid waters the overhanging willow and the lofty cotton-wood.

On the 1st of December, having completed our observations, we struck camp for our return to San Diego. The frequent rains of the previous month caused an abundance of water at convenient points along our road. In the bottoms of New river our teams were compelled to drag over muddy tracks. The opportune supply of de-

sert grama grass, which made this locality the recruiting station for our animals during our stay on the Colorado, was now entirely exhausted.

Leaving the wagon trains to follow out the ordinary road across the mountains, our advance party, under Lieutenant Coutts, left the wagon route at Cariso creek, to mount the height of the range, by a direct ascent, to the west. Following out at first a gradual slope by which we advanced towards a re-entering angle in the steep rocky range, we accomplished with ease nearly half the height of the mountain ridge. The rest of the ascent was literally climbing up steep rocky slopes, or winding along rude ravines; the height was finally gained, and was some 2,500 feet above the desert plain below. Thence our route led by a gentle slope towards the west, passing along beautifully shaded valleys, watered by clear flowing streams, and brought us to the coast near the initial point of boundary on the Pacific.

Major Emory's Report Resumed.

In 1846, I made a report of a rapid reconnoissance of the country here described by Dr. Parry. I preferred giving this description, taken from a different point of view, to reproducing my own sketch.

Dr. Parry accompanied me under the first organization as physician to the boundary commission, and also undertook the duties of zoologist and botanist. In the summer of 1854, when the second commission was organized under the new treaty with Mexico, the same position was offered him, but was declined. The appointment was then conferred on Dr. C. B. R. Kennerly.

In the list of officers of the expedition, (given on page 24,) the name of Dr. Kennerly is inadvertently omitted.

I cannot conclude the account of this part of the country, relating to the boundary, without some reference to a sad affair which occurred at the crossing of the Colorado, while the parties under my orders were engaged at that point, and which, at the time, excited much interest in the army and elsewhere. I refer to the death of the brave and accomplished Captain Thorn, of the army.

In the fall of 1849, Captain Thorn was detailed to escort, with his command, from the frontier of Missouri to California, the collector of the port of San Francisco. As may be supposed, the march was full of difficulties. When between Santa Fé and the Gila, the party was attacked by a force of Indians, which was gallantly repulsed by Captain Thorn and his command.

Arrived at the Colorado, most of the party fagged out and dispirited, Captain Thorn was obliged to use extraordinary exertion in crossing it. There was but one boat; and with that zeal and hardihood which characterized this officer in the discharge of all his duties, he stripped off his uniform, and took the personal direction of the boat. After having crossed and recrossed repeatedly, in ferrying over his command, and the party he escorted, the boat sank. The captain, although a good swimmer, became entangled with a Mexican who was in the boat, probably in the chivalrous attempt to save him, went down, and was swept away by the current.

I was at the time in my camp, distant one hundred and fifty miles, where a soldier came in and reported the circumstance, stating that the body had not been found when he left. I immediately despatched an Indian runner to Lieutenant Coutts, who commanded a

company of dragoons engaged in escorting a surveying party of the boundary commission, to turn out his whole force, and search the river to its mouth for the recovery of the captain's body. He succeeded in obtaining it some miles below the crossing, where it was found by the Indians, and had it carefully placed in a coffiin, with the intention of bringing it to my camp; but in passing through San Diego, the officers of the 2d infantry, to which regiment Captain Thorn then belonged, who were stationed there, claimed the body, and took possession of it.

Previous to setting out on the expedition to California, I applied to have Captain Thorn assigned to duty with my command. This and other considerations made me desirous of recovering his body and sending it to his friends; but I could interpose no claim over that of the officers of his own regiment. I close this brief account of the circumstances attending the loss of a valued friend and brave brother officer by giving the letter of Lieutenant Coutts, which accompanied his remains:

CAMP CALHOUN, CALIFORNIA, *November* 11, 1849.

MAJOR: I have succeeded in making a box that will probably carry the remains of the lamented Captain Thorn to San Diego. In the absence of all material and conveniences for effecting this desired object properly, my carpenters have done better than I expected of them. I send the whole under the charge of Mr. Wiatt, a citizen, with one of my teamsters and a dragoon. They will procure a fresh team at Salvation camp, and should reach San Diego by the 23d instant. It will not, of course, be necessary for the teamster and dragoon to return.

* * * * * * * * * * *

I have the honor to be, your obedient servant,

CAVE J. COUTTS,

Lieutenant 1st Dragoons, commanding Escort.

Maj. W. H. EMORY,

Commanding Escort to Boundary Commission, Camp Riley, California.

Tabulated distances of routes along and in the neighborhood of the boundary line between the United States and Mexico, from the Pacific ocean to the Gulf of Mexico, measured by viameters, by Lieut. N. Michler, Lieut. Parke, and Assistant Chandler.

From—	To—	Distance.	Distance from starting point.	Total distance.
		Miles.	*Miles.*	*Miles.*
Newtown or New San Diego	Old San Diego	2	2	
Old San Diego	Fisher's Rancho	8.95	10.95	
Fisher's Rancho	Panasquitas	8.02	18.97	
Panasquitas	San Pasqual	18.87	37.84	
San Pasqual	Laguna	12	49.84	
Laguna	Santa Isabel	11.40	61.24	
Santa Isabel	Warner's Rancho	10.33	71.57	
Warner's Rancho	San Felipe	15.88	87.45	
San Felipe	Vallecito	17.85	105.30	
Vallecito	Carrizo creek	16.60	121.90	
Carrizo creek	Big Laguna	26.41	148.31	
Big Laguna	New River	5.83	154.14	
New river	Little Laguna	4.50	158.64	
Little Laguna	Alamo Mocho	16.44	175.08	
Alamo Mocho	Cook's Well	21.94	197.02	
Cook's Well	Fort Yuma	20	217.02	
Newtown	Fort Yuma			217.02

TABLE—Continued.

From—	To—	Distance.	Distance from starting point.	Total distance.
		Miles.	*Miles.*	*Miles.*
Fort Yuma	1st Laguna	7.7		
1st Laguna	2d Laguna	1.3	9	
2d Laguna	3d Laguna	10.8	19.8	
3d Laguna	4th Laguna, camp near New Initial Point.	1.5	21.3	
Fort Yuma	Rowlett's Rancho	2.63	2.63	
Rowlett's Rancho	Camp No. 4	4.86	7.49	
Camp No. 4	Camp No. 5	20.88	28.37	
Camp No. 5	Camp No. 6	14.79	43.16	
Camp No. 6	Los Metates	2	45.16	
Los Metates	Camp No. 7	14.84	60	
Camp No. 7	Camp No. 8	11.50	71.50	
Camp No. 8	Lomas Negras, Camp No. 9	16.72	88.22	
Lomas Negras	Camp No. 10	13	101.22	
Camp No. 10	Camp No. 11	9.50	110.72	
Camp No. 11	Camp No. 12	10.50	121.22	
Camp No. 12	Camp No. 13	10	131.22	
Camp No. 13	Camp No. 14, at Tezotal	10.50	141.72	
Camp No. 14, at Tezotal	Camp No. 15, Maricopa Wells	40	181.72	
Camp No. 15, Maricopa Wells	Camp No. 16, Pimo village of Cola Azul.	15	196.72	
Camp No. 16, Pimo village of Cola Azul.	Camp No. 17, last point of the Gila.	14	210.72	
Camp No. 17, last point of Gila	Picacho on the Jornada	35	245.72	
Pichaco on the Jornada	Tucson	35	280.72	
Fort Yuma	Tucson			280.72
Tucson	San Xavier	9		
San Xavier	Agua de la Canoa	25	34	
Agua de la Canoa	Ford of Santa Cruz river	12	46	
Ford of Santa Cruz river	Tubac	2.50	48.50	
Tucson	Tubac			48.50
San Xavier	Cienega de los Pimos	24		
Cienega de los Pimos	San Pedro river	23.52	47.52	
San Pedro river	Quercus Cañon	6	53.52	
Quercus Cañon	Plaza de los Pimos, Croton Spring	30.76	84.28	
Plaza de los Pimos	Puerto de Dado	30	114.28	
Puerto del Dado	Cienega del Saus	25.30	139.58	
Cienega del Saus	Ojo de la Vaca	54.05	193.63	
Ojo de la Vaca	Rio Mimbres	17	210.63	
Rio Mimbres	Cook's Spring	17.60	228.23	
Cook's Spring	Mesilla	53.11	281.34	
Mesilla	Fort Fillmore	2.50	283.84	
Fort Fillmore	Franklin	40	323.84	
[a]San Xavier	Franklin			323.84
Tubac	Ojo del Agua de Sopori	10.25	10.25	
Ojo del Agua de Sopori	Aribaca	18.25	28.50	
Aribaca	Ojos de las Boquillas	9.10	37.60	
Ojos de las Boquillas	Laguna	25.08	62.68	
Laguna	Coyotes	9.70	72.38	
Ojos de los Coyotes	Charcos de Alvarez	16.49	88.87	
Charcos de Alvarez	Rancho de Cobota	25.73	114.60	
Rancho de Cobota	Puerto de la Nariz	44.85	159.45	
Puerto de la Naris	Sonoyta	24.55	184	

[a] The distances from San Xavier to Franklin were furnished by Lieut. J. G. Parke, Top. Engineers, U. S. A.

TABLE—Continued.

From—	To—	Distance.	Distance from starting point.	Total distance.
		Miles.	*Miles.*	*Miles.*
Tubac	Mission of Tomocacari	2. 61	2. 61	
Mission of Tomocacari	Rancho de las Calabasas	10. 37	12. 98	
Tubac	Calabasas			12. 98
Rancho de las Calabasas	Observatory at Los Nogales	8	8	
Observatory at Los Nogales	Monument on Line	3. 97	11. 97	
Monument on Line	Agua Zarca	11. 39	23. 36	
Agua Zarca	Casita	14. 79	38. 15	
Casita	Los Alisos	3. 73	41. 88	
Los Alisos	Imuris	11. 37	53. 25	
Rancho de las Calabasas	Rancho de San Lazaro	35	35	
Rancho de San Lazaro	Santa Cruz	7. 18	42. 18	
Rancho de las Calabasas	Santa Cruz			42. 18
Newtown	Fort Yuma	217. 02		
Fort Yuma	Tucson	280. 72	497. 74	
Tucson	Tubac	48. 50	546 24	
Tubac	Rancho de las Calabasas	12. 98	559. 22	
Rancho de las Calabasas	Santa Cruz	42. 18	601. 40	
Newtown	Santa Cruz, via Ft. Yuma & Tucson			601. 40
Fort Yuma	Camp near New Initial Point on Rio Colorado.		21. 30	
Tubac	Sonoyta		184	
Rancho de las Calabasas	Imuris		53. 25	
Fort Yuma	Point of departure from Gila	2. 63	2. 63	
Point of departure from Gila	Las Cuevitas	26. 45	29. 08	
Las Cuevitas	Las Tinajas Altas	16. 49	45. 57	
Las Tinajas Altas	El Corral	15. 33	60. 90	
El Corral	El Tule	1. 15	62. 05	
El Tule	La Salada	44. 89	106. 94	
La Salada	Agua Dulce	2. 89	109. 83	
Agua Dulce	Quitobaquita	6. 54	116. 37	
Quitobaquita	Santo Domingo	5. 70	122. 07	
Santo Domingo	Rancho de Sonoyta	7. 73	129. 80	
Rancho de Sonoyta[a]	Pozo del Macias	47. 15	176. 95	
Pozo del Macias	Rancho del Soñi	8. 70	185. 65	
Rancho del Soñi	Las Caborqueñas	22. 69	208. 34	
Las Caborqueñas	Rancho del Bamori	15. 83	224. 17	
Rancho del Bamori	Las Tinajitas	6. 73	230. 90	
Las Tinajitas	Altar	4. 65	235. 55	
Fort Yuma	Altar			235. 55
Altar	Charco de San Raphael	8	8	
Charco de San Raphael	Rancho del Ocuca	18. 4	26. 4	
Rancho del Ocuca	Pueblo de Santa Anna	21. 38	47. 78	
Pueblo de Santa Anna	Pueblo de Santa Marta	2. 84	50. 62	
Pueblo de Santa Marta	Pueblo de San Lorenzo	4. 68	55. 30	
Pueblo de San Lorenzo	Pueblo de la Magdalena	4. 76	60. 06	
Pueblo de la Magdalena	San Ignacio	4. 78	64. 84	
San Ignacio	Imuris	6. 62	71. 46	
Altar	Imuris			71. 46

[a] The distances from Fort Yuma to Sonoyta were furnished by Don Francisco Jimenez, Mexican commission.

TABLE—Continued.

From—	To—	Distance.	Distance from starting point.	Total distance.
		Miles.	*Miles.*	*Miles.*
Altar	Charco San Raphael	8	8	
Charco San Raphael	Rancho de las Boquillas	16	24	
Rancho de las Boquillas	Laguna near Lomita	3.10	27.10	
Laguna near Lomita	Rancho de los Alamitos	3.16	30.26	
Rancho de las Alamitos	Ford of San Ignacio	2.67	32.93	
Ford of San Ignacio	Rancho de Arequabo	2.38	35.31	
Rancho de Arequabo	Rancho Espinosa	12.80	48.11	
Rancho Espinosa	Pueblo Santa Anna	13.28	61.39	
Imuris	Rancho de Babasaqui	5	5	
Rancho de Babasaqui	Cocospera	15.81	20.81	
Cocospera	San Lazaro	17.28	38.09	
San Lazaro	Santa Cruz	7.18	45.27	
Imuris	Santa Cruz			45.27
Newtown	Fort Yuma	217.02		
Fort Yuma	Altar	235.55	452.57	
Altar	Imuris	71.46	524.03	
Imuris	Santa Cruz	45.27	569.30	
Newtown	Santa Cruz, via Ft. Yuma and Altar			569.30
Santa Cruz	1st tributary of San Pedro	13.50		
1st tributary San Pedro	2d ....do.....do..(des'ted rancho)	16	29.50	
2d ....do.....do...(deserted rancho)	3d ....do.....do	1.97	31.47	
3d ....do.....do	4th....do.....do	0.50	31.97	
4th....do.....do	5th....do.....do..(Sauz)	3	34.97	
5th....do.....do...(Sauz)	6th....do.....do	9.81	44.78	
6th....do.....do	Ash creek	22.32	67.10	
Ash creek	San Bernardino	30.16	97.26	
San Bernardino	Entrance of Guadalupe cañon	9.27	106.53	
Entrance of Guadalupe cañon	Camp in the cañon	12.73	119.26	
Camp in the cañon	San Luis Springs	11.70	130.96	
San Luis Springs	San Francisco	16.10	147.06	
San Francisco	Pelatado	27.13	174.19	
Pelatado	Janos	10.50	184.69	
Janos	Corralitas	20.26	204.95	
Corralitas	Mines of San Pedro	19	223.95	
Mines of San Pedro	Santa Maria	27.18	251.13	
Santa Maria	Salado	27	278.13	
Salado	Samalurca	36.31	314.44	
Samalurca	El Paso	25.02	339.46	
Santa Cruz	El Paso			339.46
Janos	Las Lagunitas	8.7		
Las Lagunitas	Palos Blancos	13.8	22.5	
Palos Blancos	Espia	14.1	36.6	
Espia	Desechado	18.8	55.4	
Desechado	Carrizalillo	19.3	74.7	
Carrizalillo	Mountain Camp	22.6	97.3	
Mountain Camp	Ojo de Vaca	20	117.3	
Ojo de Vaca	Rio Mimbres	18.7	136	
Rio Mimbres	Cook's Spring	19.7	155.7	
Cook's Spring	Cañon Camp	28.1	183.8	
Cañon Camp	Mesilla Ford	30.5	214.3	
Mesilla Ford	Alamos	21	235.3	
Alamos	Franklin	21.5	256.8	
Janos[o]	Franklin, (opposite El Paso)			256.8

[o] The distances from Janos to Franklin were furnished by Mr. Chandler, assistant United States boundary commission.

TABLE—Continued.

From—	To—	Distance.	Distance from starting point.	Total distance.
		Miles.	*Miles.*	*Miles.*
Franklin, (opposite El Paso)	Fort Bliss	2		
Fort Bliss	Isleta	12.14	14.14	
Isleta	Socorro	3.10	17.24	
Socorro	San Elceario	5.45	22.69	
San Elceario	Last camp on Rio Grande	59.80	82.49	
Last camp on Rio Grande	Eagle Springs	31.42	113.91	
Eagle Springs	Van Horn's Wells	19.74	133.65	
Van Horn's Wells	Dead Man's Hole	32.83	166.48	
Dead Man's Hole	Barrel Spring	13.58	180.06	
Barrel Spring	Fort Davis	18.42	198.48	
Fort Davis	Varela Springs	28	226.48	
Varela Springs	Leon Springs	33.86	260.34	
Leon Springs	Comanche Springs	8.88	269.22	
Comanche Springs	Ojos Escondidos	19.40	288.62	
Ojos Escondidos	Arroyo Escondido	8.58	297.20	
Arroyo Escondido	First camp on Pecos	16.26	313.46	
First camp on Pecos	Ferry of Pecos	38.26	351.72	
Ferry of Pecos	Live Oak creek	7.29	359.01	
Live Oak creek	Howard's Springs	30.44	389.45	
Howard's Springs	First camp on San Pedro	44	433.45	
First camp on San Pedro	2d crossing of San Pedro	19.50	452.95	
2d crossing of San Pedro	Palos Blancos	18.39	471.34	
Palos Blancos	Painted Caves	15.73	487.07	
Painted Caves	1st crossing San Pedro	2.54	489.61	
1st Crossing of San Pedro	San Felipe	10.22	499.83	
San Felipe	Arroyo Pedro	8.80	508.63	
Arroyo Pedro	Zoquete creek	3.81	512.44	
Zoquete creek	Piedra Pinta	8.86	521.30	
Piedra Pinta	Las Moras, (Fort Clark)	7	528.30	
Las Moras (Fort Clark)	Elm creek	7.13	535.43	
Elm creek	Turkey creek	15.23	550.66	
Turkey creek	Nueces	10.27	560.93	
Nueces	Head of Leona	9.04	569.97	
Head of Leona	Rio Frio	6.08	576.05	
Rio Frio	Comanche creek	8.46	584.51	
Comanche creek	Sabinal	5	589.51	
Sabinal	Rancheros creek	3.94	593.45	
Rancheros creek	Rio Seco, (Dhanis)	8.38	601.83	
Rio Seco, (Dhanis)	Quihi	15.28	617.11	
Quihi	Castroville	10	627.11	
Castroville	Leon	18	645.11	
Leon	San Antonio	6.53	651.64	
El Paso	San Antonio			651.64
San Antonio	Port Lavaca			128.50
San Antonio	Indianola			138

TABLE—Continued.

SUMMARY.

From—	To—	Distance.	Distance from starting point.	Total distance.
		Miles.	*Miles.*	*Miles.*
New San Diego, via Fort Yuma and Altar.	Santa Cruz	569.30		
Santa Cruz	El Paso	339.46	908.76	
El Paso	San Antonio	651.64	1,560.40	
San Antonio	Indianola	138.00	1,698.40	
New San Diego	Indianola			1,698.40
New San Diego, via Fort Yuma and Tucson.	Santa Cruz	601.40		
Santa Cruz	El Paso	339.46	940.86	
El Paso	San Antonio	651.64	1,592.50	
San Antonio	Indianola	138	1,730.50	
New San Diego	Indianola			1,730.50
New San Diego	Fort Yuma	217.02		
Fort Yuma	San Xavier	289.72	506.74	
San Xavier	Franklin	323.84	830.58	
Franklin	San Antonio	651.64	1,482.22	
San Antonio	Indianola	138.00	1.620.22	
New San Diego	Indianola			1,620 22

CHAPTER VIII.

ASTRONOMICAL AND GEODETIC WORK.

PREFACE.

1. Classes of observations.
2. Longitude.
3. Latitude.
4. Geodetic measurement of azimuth lines.
5. Tracing of parallels.
6. Computations.

A.—DETERMINATION OF BOUNDARY LINE FROM THE INITIAL POINT ON THE PACIFIC OCEAN TO JUNCTION OF THE GILA AND COLORADO.

1. Longitude of Camp Riley, near Initial Point, on the Pacific.
2. Longitude of junction of Gila and Colorado.
3. Latitude of Camp Riley,
4. Latitude of junction of Gila and Colorado.
5. Triangulation, transferring the determination at Camp Riley to Initial Point, on the Pacific.
6. Azimuth of straight line from Initial Point, on Pacific, to junction of Gila and Colorado.

B.—DETERMINATION OF BOUNDARY LINE FROM RIO COLORADO TO INTERSECTION OF 111TH MERIDIAN OF LONGITUDE WEST OF GREENWICH AND PARALLEL 31° 20′ N.

1. Azimuth line—astronomical positions.
2. Triangulation for determining longitude of Initial Point on the Colorado.
3. Tabulated results of latitude.
4. Distances between monuments.

C.—DETERMINATIONS OF THE BOUNDARY LINE ALONG PARALLELS 31° 47′ AND 31° 20′ N.

1. Latitude and longitude of Los Nogales, near intersection of 111th meridian and 31° 20′.
2. Latitude near the head of Santa Cruz river.
3. Latitude of San Bernardino.
4. Latitude of San Luis springs.
5. Latitude of Agua del Perro.
6. Latitude of Espia.
7. Latitude and longitude of Carrizalillo.
8. Latitude of Initial Point on Rio Grande.
9. Azimuths for laying off the Prime Vertical at above stations.
10. Elements for marking parallels of latitude 31° 20′ and 31° 47′.

D.—BOUNDARY LINE FORMED BY THE RIO GRANDE.

1. Of Longitudes:
   - *a*. Frontera.
   - *a′*. San Elceario.
   - *b*. El Paso del Norte.
   - *c*. Mouth of cañon where road from San Antonio to El Paso strikes the Rio Grande.
   - *d*. Presidio del Norte.
   - *e*. Fort Duncan.
   - *f*. Ringgold barracks.
   - *g*. Mouth of the Rio Bravo del Norte.
2. Of Latitudes:
   - *a*. Frontera.
   - *a′*. San Elceario.
   - *c*. Mouth of cañon where road from San Antonio to El Paso strikes the Rio Grande.
   - *d*. Presidio del Norte.
   - *e*. Fort Duncan.
   - *f*. Ringgold barracks.
   - *g*. Mouth of Rio Grande.

E.—TABLE OF LATITUDES AND LONGITUDES OF POINTS ON AND NEAR THE BOUNDARY LINE BETWEEN THE UNITED STATES AND MEXICO.

PREFACE.

I. Classes of Observations.

The observations for the determination of the latitude and longitude were of two classes—the first being those which were made at primary stations with the largest instruments that could be conveniently transported by land; the second, those made at places of less importance, determined by reflecting instruments, and by the transmission of chronometers from the nearest primary stations, or by flashes of gunpowder, observed simultaneously. Eighteen stations of the first class were established across the continent at the following places, named in their order, from west to east:

1. Camp Riley, near initial point, on the Pacific coast; 2. Junction of the Gila and Colorado; 3. On the Colorado, where the line leaves that river; 4. Quitobaquita; 5. Los Nogales, near 111th meridian of longitude; 6. San Bernardino, near parallel 31° 20′; 7. San Luis springs, near parallel 31° 20′; 8. Agua del Perro; 9. Espia; 10. Carrizalillo, near parallel 31° 47′; 11. Frontera; 12. San Elcearío; 13. Initial point of boundary on parallel 31° 47′; 14. Cañon where the San Antonio road leaves the Rio Bravo; 15. Presidio del Norte; 16. Eagle Pass, (Fort Duncan;) 17. Ringgold Barracks; 18. Mouth of Rio Bravo.

I do not enumerate the very many points of lesser importance determined by the sextant and chronometer, as no special notice is required of the means used in their determination. It may be as well to state, however, that in all cases where observations were made for latitude with reflecting instruments, stars were taken, both north and south, and at altitudes as nearly equal as could be obtained; and when local time was obtained by these instruments, stars were taken both east and west, of nearly equal altitudes, and as near the prime vertical as they could be found. In this way we attempted to avoid the errors arising from refraction and from the eccentricity of the instrument.

In some cases, where I had direct comparisons with results obtained by the large instrument, I ascertained that the latitude of a place determined by the Gambey sextant in the proper hands, in a single night, might be relied upon to within 3″ or 5″; and if the observation was repeated for two nights, the result might be relied upon to be within 2″ of the true position.

II. Longitude.

The longitudes of 1, 2, 4, 5, 10, 11, 12, 15, 16, 17, 18, were obtained by observations on the transit of the moon and moon culminating stars, with a telescope of forty-six inches' focal length, by Troughton & Simms, of London, and with a smaller one of thirty-six inches' focal length. Occultations were observed, whenever practicable; but, owing to the impossibility of obtaining corresponding observations, they proved of little value; indeed, but few were observable. Occultations are no doubt of the greatest value where corresponding observations at some established point are observed; but for the general purposes of a survey, conducted in distant regions, they are not a sure reliance. They occur too seldom; and to see the instant of immersion and emersion of a star requires great steadiness in the telescope, which in the field can be rarely obtained, owing to the difficulty of protecting the telescope from the wind, and of getting a firm support.

After giving what I considered a fair trial in the field to all the methods now known, it was concluded to place the chief reliance on the transit of the moon. If, however, it happens to me to be again in charge of extensive operations of the kind, I shall make some effort to improve the instruments for the observation of lunar distances. I am satisfied it is in that direction itinerant observers must look for improved methods and facilities in obtaining longitude.

When the reflecting instruments are made so as to be placed more firmly and quickly in any given plane, and the methods of computing lunar distances are improved and simplified, it will be in the power of the observer any clear night, when the moon is above the horizon, to multiply his observations so as to obtain close results. The instruments in present use have not sufficient power to observe near contacts of the moon and stars; and in the attempts which have been made to increase the power of the telescope, the instrument becomes insupportable by the hand for repeated or nice observations.

In all cases where it was not necessary to declare the result on the spot, as at those stations at the extremities of azimuth lines, and at stations such as the 111th meridian of longitude, which formed turning-points in the boundary, the longitude was deduced from corresponding observations made at Greenwich. In some few cases we obtained corresponding observations at the American observatories; but the observations were not sufficiently continuous at any of these last-named observatories to enable us to rely upon them. And I have here to repeat (what I have heretofore expressed to the American Association for the Advancement of Science) my obligations to Astronomer Royal Airy for the trouble he has taken to furnish the corresponding observations in MSS. before they were published at Greenwich.

In the personal account, mention is made of the agreement made with the Mexican commissioner to declare the 111th meridian, from computations based on the data afforded by the Greenwich Ephemeris,* before receiving the corresponding observations. This arrangement was a necessity arising from our isolated position near the centre of the continent, cut off from all intercourse except by expresses protected by armed escorts. To have awaited the reception of the corresponding observations would have detained us fully eighteen months, at great expense—a result not contemplated by either the United States or Mexican governments, and not contemplated by the treaty, which provided against any possible errors in the location of the line by declaring, "that line shall alone be established upon which the commissioners may fix; their consent in this particular being considered decisive and an integral part of this treaty, without necessity of ulterior ratification or approval, and without room for interpretation of any kind by either of the parties contracting."

The observations at 1, 11, 13, 14, 15, 17, were made by myself in person; those at 2, by Lieutenant Whipple; at 4, by Señor Jimenez, first engineer Mexican boundary commission; at 5, 10, and 16, by Assistant John H. Clark; at 18, by Assistants Gardner and Clark; and at 12, by Lieutenant W. F. Smith. At most of the stations the observations were carried through at least three lunations; but, it will be seen, the result was not changed materially after the first lunation.

The longitude of the point where the boundary leaves the Rio Bravo was transferred from Frontera by triangulation; and the longitude of El Paso and of No. 14 (the cañon) were respectively transferred from Frontera and San Elcearío by flashes of gunpowder simultaneously

* When this agreement was made, no copy of the American Ephemeris had been received, nor was I aware it had been published.

observed. It was my desire to extend this beautiful and accurate mode of obtaining differences of longitude to many other stations; but in a country without settlements, and traversed by bands of savages who kill at sight, it was impossible to do so, as every party that went out had to be escorted by ten or fifteen armed men.

Where neither of the above means could be resorted to, longitude was obtained by transmission of chronometers from some established point. This method, so successful at sea, where the motion is uniform and smooth, has objections on land, principally the impossibility of moving chronometers without deranging the rate. Every method of transporting them was tried—on carriages, on foot, and on horseback; and an ordinary spring-carriage was found to be the best. No test can be applied to check an error in determining longitude by the transmission of chronometers; for even with three chronometers it is possible for all to be affected in the same way, though of course not in the same degree—that is to say, all may run, while travelling, too fast or too slow; and when you halt, may resume their former rates.

The observations at the two stations 11 and 12—Frontera and San Elceario—being about the centre of the continent, and in a geographical point of view more important than any others, were combined to arrive at the results given.

The longitude of Frontera from moon culminations, extending through four lunations, computed from the predicted place of the moon and moon culminating stars, given in the Greenwich Ephemeris for 1851–'52..... = 7h 05m 55s.3

The same, after applying the correction due for corresponding observations made at Greenwich and furnished in MSS. from the Observatory at that place, is—

For the 1st lunation,	December and January,	1851–'52.....	7	06	11.38
2d "	January and February,	1852.....			13.34
3d "	February and March,	"			14.73
4th "	March and April,	"			12.48
Mean.....			7	06	12.98
Difference due to correction.....					+ 17.68

The longitude of San Elceario deduced from observations on forty moon culminations, extending through three lunations, computed from the predicted place of the moon and moon culminating stars, given in the Greenwich Ephemeris for 1852..... 7h 04m 46s.55

The same, after applying the correction due for corresponding observations made at Greenwich, is—

For the 1st lunation,	January and February,	1852.....	7	05	02.52
2d "	February and March,	"			04.31
3d "	April,	"			03.44
Mean.....			7	05	03.42
By combining these observations with corresponding ones at Cambridge, Mass., we get.....			7	05	04.3
Difference due to correction.....					+ 17.75

The coincidence between these differences is satisfactory. The computations were made by independent computers: the first, by Assistant J. H. Clark; the second, by Assistant J. O'Donoghue. The observations for the first were made by myself; those at San Elcearío by Lieutenant W. F. Smith.

To give greater effect to the results, and to establish beyond the probability of future change the longitude of Frontera—which is about the longitude of the middle of the continent, and is a primary station on the survey of the boundary—an attempt was made to connect the observatory of San Elcearío with that of Frontera by flashes of gunpowder, and the following is the result. It should be observed that the Frontera here mentioned is not the Frontera of the old maps of North America. Frontera signifies a frontier town, but in this instance is the name given by its proprietor to a newly-constructed hut, built immediately on the ratification of the treaty of Guadalupe Hidalgo, at a point some eight miles above El Paso, where it was supposed the boundary under that treaty would leave the Rio Bravo. The difference of longitude between Frontera and San Elcearío, observed by flashes on the nights of the 14th, 18th, 19th February, and 14th March, 1852, was found to be as follows:

Date.	No. of observat'ns each night.	Diff. of long., El Paso, east of Frontera.	No. of observat'ns each night.	Diff. of long., San Elcearío, east of Frontera.
1852.		s.		m. s.
February 14	14	16.03	13	1 7.16
18	15	16.06	15	1 7.54
19	12	15.84	15	1 7.36
March 14	12	15.84	14	1 7.15
	Mean of 53 observations = 15.94		Mean of 57 observations = 1 7.30	

The difference of longitude by observations on the moon and moon culminating stars is 1^m $08^s.58$, which agrees with that determined by flashes within $1^s.3$. Now, assuming the difference determined by flashes as correct, and giving equal weight to the observations at each station, the longitude of Frontera will be diminished by $0^s.65$, and that of San Elcearío will be increased by the same quantity; so that the final result will be:

Frontera, west of Greenwich	7^h 06^m $12^s.33$
San Elcearío " "	7^h 05^m $04^s.95$

The longitude of the observatory at El Paso erected by the Mexican commission, two hundred feet south and five hundred feet west of the Cathedral tower, was determined by flashes observed simultaneously by Señor Salazar and myself on the nights stated in the preceding part of this article, to be $15^s.94$ east of Frontera; hence the longitude of El Paso, 7^h 05^m $56^s.39$.

A discussion of the longitudes of the Presidio del Norte and of Eagle Pass, on the Rio Grande, shows a difference between the longitude obtained by using the Greenwich Ephemeris and that obtained by using the corresponding observations at Greenwich, to be in the first case $+19^s$, and in the second $+17^s.1$. Comparing these with the same quantities obtained at Frontera and San Elcearío, made in the same year, it will be seen that there is a coincidence, showing that in this case the error in the predicted place of the moon is nearly uniform for the same year.

The difference between the longitudes obtained in 1849, those computed from data in the

Greenwich Ephemeris, and those obtained by corresponding observations at Greenwich, was pretty generally + 12". This confirms the importance of a thorough revision of the lunar tables. The uniformity observable in these results shows, I hope, the probability of detecting the error, and eliminating or reducing it.

I have deposited in the Department of the Interior two volumes containing, in tabulated form, all the individual observations and computations upon which the results obtained on the boundary for longitude are founded. I give a leaf from these volumes, to show the manner in which the observations were made and computed. It has been suggested to me to present them for publication; but as each would make a volume nearly the size of the Greenwich Observations, I have contented myself, in this publication, with presenting in tabulated form the separate results, and in two cases—at the initial point on the Pacific, and at the mouth of the Rio Bravo—I have extended the table so as to show in detail the manner in which all the observations and computations have been tabulated. It has been found convenient, also, to incorporate with these tables the computations by which the azimuth lines forming portions of the boundary were determined.

III. Latitudes.

The latitudes of all the primary astronomical stations, except four, were determined either by myself or by Assistant J. H. Clark, with the zenith telescope. Two of the four excepted were determined by Lieutenant Whipple, the other two by Lieutenant Michler. I have placed in the Department of the Interior four volumes containing the individual observations and the computations for the latitude of the primary stations. In regard to the publication of these volumes, the same remarks that were made above in reference to the longitudes apply here. I give a leaf from them also, to show the mode of tabulating and computing the observations.

The tables attached hereto present a recapitulation of all the results for the latitudes of the primary stations, including the station determined by Lieutenant Michler, by circum-meridian altitudes of northern and southern stars observed with a sextant, and those determined by Lieutenant Whipple, by observing the transit of stars over the prime vertical.

The method habitually used on the boundary for obtaining latitude—that by the measurement of the difference of zenith distance of stars near the zenith, and nearly equidistant, north and south—is now so generally used and approved as to make no particular notice of it necessary. It was first adopted by Captain Talcott, in 1835, on the survey of the Ohio boundary. It was resumed by myself on the northeastern boundary; and some of my results coming under the eye of Professor Bache, he concluded to try it on the Coast Survey, and called on me for any suggestion I might have to make in reference to the form. I made the suggestions which resulted in the form in which the instrument is now made by Troughton & Simms, of London, and is that which I used on the present boundary survey.

Attached to the table combining the results of the observations at each station is a table showing the correction applied to the places of stars, derived either from actual observations of stars at the Washington Observatory, and politely furnished for the use of the boundary survey, or from the Twelve-year Catalogue of the Greenwich Observatory.

A comparison of the results obtained by the zenith telescope, with the errors developed in the declination of stars of the British Association catalogue, will show the rapid march field operations have made, in point of accuracy, upon the observations at the fixed observatories.

While the results confirm the excellence of the zenith telescope for field operations, they indicate the necessity of a more extended and accurate catalogue of stars.

IV. Geodetic Measurement.

The azimuth lines were ascertained by observations on the elongation of Polaris, and the measurement on the face of the earth was made with several different instruments. Those in California with a transit by Ertel & Son, Munich; with a horizontal limb of fifteen inches diameter, graduated to read to 10″. The instruments used in tracing the parallel of latitude were a ten-inch azimuth circle, by Gambey, of Paris; two by Bruner; and one by Draper, of Philadelphia. Some of the barometers used were by Bunten, of Paris; but they were chiefly made by James Green, of New York. They, together with the thermometers, were compared with the standard at the Smithsonian Institution, both before and after being used.

In tracing the parallels of latitude 31° 47′ and 31° 20′, and also in prolonging the azimuth line across California, and from the Rio Colorado to the 111th meridian of longitude, it frequently happened that it was convenient to take the meridians determined by the transit instrument, but most usually they were taken from the measurements of the elongation of Polaris.

V. Tracing the Parallels.

The parallels were determined by tracing a tangent to the prime vertical at any given point, and measuring the ordinates to the parallel. The use of the tangent instead of the chord was preferred, because the measurement of the ordinates, confided to a variety of assistants, presented always an increasing series, and was less liable to lead to confusion; a precaution very necessary in a country where water is scarce, and where parties operating have constantly to be on the alert against attacks of Indians. A general sketch of the stations established in latitude to trace these parallels is stated in the agreement with the Mexican commissioner, which will be found under the head of Personal Account, in Chapter II, and it is therefore unnecessary to repeat it here.

Great as were the embarrassments in other respects, the absence of trees gave us great facility in tracing these lines, and enabled us easily to correct errors resulting from producing long lines.

In the determinations of latitude along the same parallel, it will be seen we used the same instrument, and, as far as practicable, the same sets of stars; so we were quite certain of getting correct differences of latitude between two stations. In no case was it attempted to produce the same tangent in one direction more than thirty miles, and it was then always compared with the tangent from the new latitude station. The parallel of latitude thus deduced by separate and independent operations seldom differed more than a few feet; and in no case was the discrepancy sufficiently great to make it necessary to retrace our steps. The tangents, being few in number, were generally laid off by myself, and prolonged by the principal assistant surveyors, who were furnished with tables of ordinates and angles, which will be found in the appendix, that enabled us at once, and by simple measurements, to establish points in the parallels forming the boundary.

VI. Computations.

The computations were all made in the field originally, and subsequently revised in the office.

The observations made in California were computed in the field by myself, Lieutenant Whipple, and James Nooney. They were all subsequently revised by Professor Hubbard, and the new element of corresponding observations introduced into the computations for longitude. The observations on the Rio Bravo were computed in the field by myself and Assistants J. H. Clark and J. O'Donoghue, and revised in the office by Captain George Thom, corps of topographical engineers, and Assistant C. N. Thom.

The observations on the parallels 31° 47′ and 31° 20′ were all computed in the field by Principal Assistant J. H. Clark, Lieutenant Turnbull, corps of topographical engineers, and Assistant Hugh Campbell, and revised in the office by the same.

The observations at the point where the line strikes the Rio Colorado were made and computed by Lieutenant Michler and Assistant J. O'Donoghue.

A.

Determination of the line forming the boundary between the United States and the republic of Mexico, from the Initial Point on the Pacific ocean to the point where the "Gila river empties into the Colorado." By Brevet Major William H. Emory, Chief Astronomer.

This portion of the boundary consists of a straight line from a point on the Pacific ocean, one marine league south of the port of San Diego, to the junction of the Gila and Colorado. The most obvious way of determining the direction of this line was to connect the two points by triangulation, and in this way ascertain their relative positions on the face of the earth, and compute the azimuth of the line joining them. But the character of the intervening country made it impossible to pursue this mode of operating when the time and means at the disposal of the joint commission were considered. Triangulation is the surest, but it is the slowest and most expensive method of surveying, even in old-settled countries, where the stations to be selected are easily accessible in wagons. In the country under consideration obstacles presented themselves almost insurmountable. The whole distance, about 148 miles, may be divided into two nearly equal parts, differing in character, but both equally unfavorable to geodetic operations. The first, rising in steppes from the sea, and covered with spinose vegetation, attains, in abrupt ascents, the height of five or six thousand feet in the short space of thirty miles. From this point, for about thirty miles, the country is occupied by a succession of parallel ridges, striking the boundary nearly at right angles, and separated by deep, and sometimes impassable chasms. It then falls abruptly to near the level of the sea. The remainder of the line stretches across the desert of shifting sand at the head of the Gulf of California, destitute, for the most part, of both water and vegetation.

The following is the order in which are arranged the subjects embraced in the determination of the line:

1. The longitude of Camp Riley, near the Initial Point.
2. The longitude of Camp near the junction of the Gila and Colorado.
3. The latitude of Camp Riley, near the Initial Point.
4. The latitude of Camp near the junction of the Gila and Colorado.
5. Transfer of the latitude and longitude of Camp Riley, by triangulation, to the Initial Point.
6. Azimuth of straight line from Initial Point, on Pacific, to junction of Gila and Colorado.

Numbers 1, 3, 5, and 6 are by myself. Numbers 2 and 4 are by Lieutenant Whipple.

The tracing of the line on the ground was partly by myself and Lieutenant Whipple, but chiefly by Captain E. L. F. Hardcastle, corps topographical engineers.

The computation of the azimuth of the line was made in the field. In this computation the earth was supposed to be a spheroid of revolution of the following dimensions, which are those determined by Bessel from all the measurements up to that time, (1849,) and the elements given by him were converted into English measure by adopting the following value of the metre, viz:

39.6850 inches; logarithm	1.5951741293.
Equatorial radius	= 6974129.339 yards.
Polar radius	= 6950815.059 "

I am indebted to Professor Airy for the observations at Greenwich for 1849; and for the recomputation of the longitude and the application of the correction due to the corresponding observations on moon and moon culminating stars, I am indebted to the assistance of Professor J. S. Hubbard, of the National Observatory.

I. LONGITUDE OF CAMP RILEY, NEAR THE INITIAL POINT.

The observations with the transit instrument have been reduced in the following manner:

The equatorial intervals of the transit wires having been determined as accurately as possible, the imperfect transits were corrected, by applying to the mean of the observed wires the mean of their equatorial intervals, multiplied by the secant of the stars' declination.

For circum-polar stars, each wire was reduced separately, and the mean of the results taken. In the case of the moon, allowance was made for its motion by the method and tables of Bessel. (Tabulæ Regiomontanæ, pp. LII and 537.)

Denoting by a the constant of correction for azimuth of the instrument, by b the constant for level, and by c that for collimation, and by d the star's right ascension, δ its declination and z its zenith distance, and by t the chronometer time of its transit, and by Δt the correction of the chronometer at the time t, we have the known formula—

$$d = t + \Delta t + a \text{ sin. } z. \text{ sec. } \delta + b. \text{ cos. } z. \text{ sec. } \delta + c. \text{ sec. } \delta.$$

If φ denote the latitude of the observer, and if

$$m = b. \text{ cos. } \varphi + a. \text{ sin. } \varphi,$$
$$n = b. \text{ sin. } \varphi - a. \text{ cos. } \varphi,$$

the expression above becomes—

$$d = t + \Delta t + m + n. \text{ tan. } \delta + c. \text{ sec. } \delta,$$

or

$$d = t + \Delta t' + m + (n + c.) \text{ tan. } \delta + c. (\text{sec. } \delta - \text{tan. } \delta)$$

which last form has been employed in the reductions.

In the observations at Camp Riley, $c = o$ for nearly the whole series, and is small enough at all times to have no effect in the last term of the formula; in the other series, one or two cases occur where it has been necessary to take this last term into account.

Where, as in the present case, only the right ascension of the body is wanted, the quantities Δt and m being constant for the evening, may be combined together, and then the last term of

one equation, always small, and vanishing at no great distance from the equator, being introduced when necessary, and the requisite correction for the chronometer rate being applied, it is evident that but two equations are necessary for the determination of the unknown quantities. One is generally furnished by a circum-polar star; the other by the mean of the equations, corresponding to all the stars near the moon's path, in order the more completely to remove all chance of constant error from the desired result. The equations being solved, furnish the quantities given below, and which have been applied to the observations.

The first column contains the date; the second the name of the object observed; the third shows the position of the instrument, (lamp east or west.) Next follow columns 4, 5, 6, 7, 8, 9, 10, the seconds of observed transit, and column 11, the mean of the transit over as many wires as have been observed. Column 12 contains the correction to be applied to this mean for an imperfect transit; column 13 the correction for instrumental error, or the quantity $(n + c)$ tan. $\delta + c$. (sec. δ — tan. δ,) the last term of which is generally equal to o; and column 14 gives the correction of chronometer, and the constant term of instrumental correction, or the quantity $\Delta t + m$.

In cases where a mean-time chronometer has been used, this column includes also the reduction of mean to sidereal time, the quantities in all the preceding columns being in mean time. In column 15 is given the sum of the quantities; in columns 11, 12, 13, and 14 are the observed right ascension of the object; and the last column shows the tabular right ascension, taken in the order of preference from the Nautical Almanac, the Greenwich Twelve-year Catalogue, or the Catalogue of the British Association.

The next step was to deduce the required corrections of the assumed longitude of the place, by comparing the observed AR. of the moon with that corresponding to the assumed longitude already determined very approximately by computations in the field. For this purpose, the tabular AR. was interpolated from the moon culminating list of the Nautical Almanac, using fourth differences, and it was found that the assumed longitude corresponded perfectly to the results from the uncorrected tabular place of the moon. But the extracts from the observations at Greenwich, given below, show a correction of the latter to be necessary; and this being applied, the corresponding correction of the assumed longitude was determined and also applied.

Constant values employed in the reductions.

OBSERVATORY AT CAMP RILEY.

Equatorial intervals of transit wires.

I.	II.	III.	IV.	V.	VI.	VII.
s.	s.	s.	s.	s.	s.	s.
+ 51.163	+ 33.971	+ 17.165	+ 0.22	— 17.092	— 34.089	— 51.141.

	$n + c$.	$\Delta t + m$.
	s.	s.
July 27....	0.000	+ 11.99
28....	0.000	+ 12.50
29....	0.000	+ 12.48
30....	0.000	+ 12.45
31....	— 0.779	+ 12.90
Aug. 2....	— 0.936	+ 12.63
3....	— 0.788	+ 10.85
26....	— 1.852	+ 6.32
27....	— 2.694	+ 6.30
28....	— 2.231	+ 6.28
29....	— 1.778	+ 5.87
Sept. 3....	— 2.613	+ 1.84
4....	— 2.427	+ 0.49

	$n + c$	$\Delta t + m$.
	s.	s. m. s.
*Sept. 5...	+ 2.716	— 2 25 29.02
24...	+ 1.368	— 2 24 54.55
27...	+ 1 041	— 2 24 47.66
28...	+ 0.792	— 2 24 45.66
29...	+ 1.195	— 2 24 42.53
30...	+ 1.204	— 2 24 42.23
Oct. 23...	+ 0.934	— 2 23 54.74
25...	+ 1.471	— 2 23 48.85
28...	+ 1.198	— 2 23 40.49
29...	+ 1.764	— 2 23 38.85
Nov. 1...	+ 1.764	— 2 23 31.36
2...	+ 1.764	— 2 23 28.09
5...	0.000	— 2 23 22.54

OBSERVATORY NEAR JUNCTION OF THE GILA AND COLORADO RIVERS.

Equatorial intervals of transit wires.

I.	II.	III.	IV.	V.	VI.	VII.
s.	s.	s.	s.	s.	s.	s.
+ 52.790	+ 35.078	+ 17.467	+ 0.44	— 17.489	— 35.180	— 52.730.

	$n + c$.	$\Delta t + m$.
	s.	m. s.
Oct. 3....	— 1.339	+ 41.79
4....	— 1.026	+ 39.05
5....	— 0.450	+ 19 2.06
6....	— 0.000	+ 31.52
7....	— 0.878	+ 29.66
23....	— 29.100	+ 8.79
24....	— 1.410	— 19.15
25....	— 0.450	— 27.80
26....	— 0.437	— 29.66
27....	— 0.147	— 34.19
28....	— 0.297	— 36.50
29....	— 0.607	— 39.04
30....	— 1.435	— 41.56
31....	— 1.938	— 45.01

	$n + c$.	$\Delta t + m$.
	s.	m. s.
Nov. 1....	— 0.802	— 45.76
2....	— 0.199	— 49.99
3....	0.000	— 52.07
4....	0.000	— 54.11
5....	— 0.411	— 55.17
6....	0.000	— 57.31
20....	0.773	+ 19 22.04
22....	0.000	— 1 29.88
23....	0.000	— 1 32.29
24....	+ 0.672	— 1 35.09
25....	0.000	— 1 37.36
27....	— 4.370	+ 19 25.83
29....	— 4.270	— 1 42.73

* The value of Δt adopted for the mean-time chronometer being the complement of the time value, it becomes necessary to change the sign of $(n + c)$

Longitude of Camp Riley: By William Hemsly Emory.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTION FOR— Imperfect transits.	Instrument.		Chronometer.		OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	m. s.	s.		s.		h. m. s.	s.
July 26	ε Bootis		16.0	35.0	54.0	13.2	32.5	52.0	11.2	14 38 13.41		0 00	+	11.14		14 38 24.55	24.61
	α² Libræ		27.2	47.0	5.0	23.5	40.5	58.5	16.0	14 42 23.67		0.00		11.14		14 42 33.81	33.74
27	Moon, 1st L.						39.5	57.5	15.0	15 2 57.33	— 38.66	0.00	+	11.96		15 2 33.63	
	β Libræ			9.2	26.2	43.4	1.0	18.0	35 0	15 8 52.13	— 8.63	0.00		11.97		15 8 55.47	55.60
	α Serpentis		48.6	6.0	23.2	38.8	56.8	14.0	98.0	15 36 39.37		0.00		11.99		15 36 51.36	51.69
	θ Libræ		11.6	29.2	46.4	4.0	22.4	39.6	54.8	15 45 4.00		0.00		11.99		15 45 15.99	16.14
28	α Serpentis	W.	47.2	5.0	22.0	39.0	56.5	13.5	30.5	15 36 39.10		0.00	+	12.49		15 36 51.59	51.67
	θ Libræ			28.2	46.0	4 0	22.0	39.2	56.8	15 45 12.70	— 8.88	0.00		12.49		15 45 16.31	16.13
	Moon, 1st L.		42.0	1.5	19.5	37.6	56.0	13.5	32.0	15 51 37.59		0 00		12.49		15 51 50.08	
	β¹ Scorpii		35.8	54.0	12.0	29.6	47.8	6.5	24.0	15 56 29 96		0.00		12.49		15 56 42.45	42.04
	δ Ophiuchi		24.5	42.2	58.6	16 0	33 0	50.0	7.5	16 6 15.97		0.00		12.50		16 6 28.47	28.16
	α Scorpii		2.0	20.6	40.8	59.2	18.4	36.4	53.8	16 19 58.74		0.00		12 50		16 19 11.24	11.87
	(5579)		46.8	4.2	22.8	40.0	58.8	16 8	34.2	16 32 40.52		0 00		12.50		16 32 53.02	53.11
	η Ophiuchi				15.5	33.2	50.8	8.6	28.0	17 1 50.82	— 17.67	0.00		12.51		17 1 45.66	45.89
29	Moon, 1st L.	W.	46.0	5 0		41.5	58.5	17.5	35.4	16 41 43.98	— 3.06	0.00	+	12.47		16 41 53.39	
	*Anonymous				51.5	9.5	27.0	44.5	2.5	17 2 27.00	— 17.67	0.00		12.47		17 2 21.80	
30	(5579)	W.	47.0	5.0	23.0	41.0	59.0		34.0	16 32 34.83	+ 5.95	0.00	+	12.45		16 32 53 23	53.68
	η Ophiuchi		39.8	58.0	15.2	33.0	51.0	8.6	26 0	17 1 33.09		0.00		12.45		17 1 45.54	45.78
	Moon, 1st L.		45.2	4.0	22.2	40.5	58.4	17.2	36.2	17 39 40.53		0.00		12.45		17 32 53.98	
31	(5579)		47.5	5.0	23.0	40.5	58.5	15.5	32.5	16 32 40.50		+ 0.25	+	12.21		16 32 52.96	53.07
	α Herculis		43.8	0.8	18.2	36.2	53.2	11.2	29.0	17 7 35.92		— 0.99		12.20		17 7 47.92	47.85
	Moon, 1st L.		38.0	51.0	9.6	28.0	46.0	4.5	23.0	18 24 27.87		+ 0 28		12.19		18 24 40.34	
	α Lyræ							24.0	46.9	18 32 25.90	— 54.57	— 0.63		12.19		18 31 51.99	51.95
Aug. 1	α Serpentis	W.	49.2	6.0	23.2	40.4	57.2	14.8	31.6	15 36 40.34		— 0.09	+	11.76		15 36 52.01	51.69
	β¹ Scorpii		36.0	54.0	10.4	30.0	48.8	6.4	24.4	15 56 30.60		+ 0.98		11.76		15 56 42.04	41.99
	δ Ophiuchi		25.2	42.0	58.4		31.6	50.0	8.0	16 6 15.87		+ 0.95		11.76		16 6 27.68	28.12
2	γ Draconis	W.	33.5	2.0	29.0	56.5	23.6	51.0	18.5	17 32 56.39		— 0.76	+	12.63		17 33 8.15	8.26
	μ¹ Sagittarii			57.0	15.2	33.5	53.0	10.0	29.0	18 4 42.76	— 9.14	+ 0.94		12.63		18 4 46.51	46.69
	δ Ursæ Minoris			36.0	54.0	12.0	30.0	47.5	37.0	18 23 35.99	−2 23.97	— 10.48		12.63		18 21 14.16	13.50
	51 (Hev.) Cep., S.P.		37.0	39.5	32.0	23.0	16.0	15.5		18 24 26.00	+2 57.32	+ 12.96		12.63		18 27 48.91	52.21
	β Lyræ			39.5	59.5	20.0	40.5		20.0	18 44 29.92	— 10.19	— 0.41		12.63		18 44 31.95	32 72
	ζ Aquilæ		25.5	42.5		18.2	35.5	53.0	10.8	18 58 17.93		— 0.15		12.63		18 58 30.41	30.65
	μ¹ Sagittarii		51.4	9.0	27.0	45.0	2.8	20.5	38.3	19 19 44.86		+ 0.90		12.63		19 19 57.69	57.54
	ε¹ Sagittarii		1.0	18.5	36.5	54.0	12.0	30.0	47.5	19 31 54.21		+ 0.19		12.63		19 31 7.03	6.73
	ζ Sagittarii			37.5	55.5	13.0	31.0	48.0	6.5	19 49 21.92	— 8.87	+ 0.18		12.63		19 49 25.86	25.81
†	Moon, 1st L	E.	16.4	34.4	52.8	11.2	29.2	47.5	6.0	20 9 11.07		+ 0.19		12.63		20 9 23.89	
	ρ Capricorni		10.8	28.5	46.5	4.5	22.5	40.0	58 9	20 20 4.40		+ 0.21		12.63		20 20 17.24	17.31
	μ Aquarii		28.5	46.0	3.0	20.2	37.5	55.0	12.0	20 44 20.31		+ 0.11		12.63		20 44 33.05	33.08
3	α¹ Capricorni	E.		33.2	50.0	8.0	26.5		1.0	20 9 11.74	— 3.59	+ 0.18	+	10.87		20 9 19.27	19.19
	α² Capricorni			56.7	13.5	31.5	50.0		24.5	20 9 35.24	— 3.51	+ 0.18		10.87		20 9 42.77	43.06
	ρ Capricorni		12.5	30.0	48.4	6.0	24.0	42.0	0.2	20 20 6.14		+ 0.26		10.85		20 20 17.26	17.29
	η Capricorni		45.8	3.8	21.8	40.0				20 55 19.85	+ 27.30	+ 0.29		10.83		20 55 51.27	50.99
	Moon, 1st L.			49.0				1.6		21 1 25.30	+ 0.07	+ 0.22		10.82		21 1 36.41	
4	ε Ursæ Minoris	E.	13.5	21.8	28.0	35.0	42.0	49.5	56.0	17 1 35.11		— 5.78	+	9.99		17 1 39.32	39.09
	β Draconis		30.5	58.0	26.5	54.5	22.8	50.2	18.5	17 26 54.43		— 1.02		9.98		17 27 3.39	3.27
	58 Ophiuchi			39.0	57.0	15.6	34.0	52.0	10.4	17 34 24.67	— 9.17	+ 0.31		9.98		17 34 25.79	25.70
	4 Sagittarii		31.0	49.5	8.5	27.0	45 4	4.4		17 50 17.63	+ 9.32	+ 0.35		9.97		17 50 37.27	37.25
	γ Draconis					58.8	38.4	53.6	21.5	17 53 40.06	— 41.10	— 0.96		9.97		17 53 7.97	8.22
	μ¹ Sagittarii					36.5	54.5	12.8		18 4 54.60	— 18.28	+ 0.30		9.97		18 4 46.59	46.68
	δ Ursæ Minoris					16.0				18 21 16.00	— 0.37	— 13.16		9.96		18 21 12.41	12.95
	51 (Hev.) Cephei		38.0			27.0				18 18 32.50	+8 51.47	+ 16.30		9.96		18 27 50.23	50.22
	α Lyræ		37.0	59.0	21.0	42.6	4.5	26.8	48.0	18 31 42.79		— 0.63		9.96		18 31 52.03	51.91
	β Lyræ		22.2	43.0	2.8			4.4	24.5	18 44 19.38	+ 4.11	— 0.51	+	9.95		18 44 32.93	32.71

* Observed by mistake for η Ophiuchi.

† Instrument reversed.

Longitude of Camp Riley—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTION FOR— Imperfect transits.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	m. s.	s.	s.	h. m. s.	s.
Aug. 19*	ε Ursæ Minoris...	W.	.....	20.4	27.6	34.8	42.4	49.0	56 0	17 2 38.37	−1 3.51	− 6.99	+ 7.47	17 1 35.34	38.61
	β Draconis		32.6	0.4	28.0	56.4	24.4	52.4	20.4	17 26 56.37	.....	− 1.23	7.47	17 27 2.61	2.66
	58 Ophiuchi.....		22.4	40.4	58.8	17.4	35.6	54.0	12.4	17 34 17.30	.....	+ 0.37	7.47	17 34 25.14	25.53
	4 Sagittarii.....		33.6	51.6	10.0	28.6	47.2	6.0	25.0	17 50 28.86	.....	+ 0.49	7.47	17 50 36.75	37.09
	μ¹Sagittarii.....		44.0	2.0	20.4	38.8	57.2	15.4	33.2	18 4 38.71	.....	+ 0.37	7.47	18 4 46.55	46.53
	δ Ursæ Minoris...		.....	41.6	30.4	16.6	3.8	49.2	38 4	18 23 40.00	−2 23.92	− 15.96	7.47	18 21 7.59	8.20
	ξ Aquilæ.....		.....	.....	.....	.....	40.4	58.0	16.0	18 59 58.13	− 35.10	− 0.23	7.47	18 59 30.27	30.53
	δ Aquilæ.....		57.0	14.0	30.8	48.0	5.6	22 4	38.8	19 17 48.09	.....	− 0.05	7.47	19 17 55.51	55.54
	γ Aquilæ.....		8.4	26.0	43.2	0.4	18.0	34.6	51.6	19 39 0.31	.....	− 0.17	7.47	19 39 7.61	7.36
	α Aquilæ.....		26.6	45.5	3.2	20.4	37.6	54 8	12.0	19 43 20.30	.....	− 0.14	7.47	19 43 27.63	27.48
	α¹Capricorni		19.0	36.0	53.8	11.2	28.5	46.0	3.5	20 9 11.20	.....	+ 0.23	7.47	20 9 18.89	19.20
	α²Capricorni		43.0	1 0	18.0	35.2	52.5	9.0	27.8	20 9 35.21	.....	+ 0.22	7.47	20 9 42.90	43.07
	α Cygni		2.0	26.0	50.0	14.0	38.0	2.4	26.5	20 36 14.13	.....	− 0.94	7.47	20 36 20.66	20.11
	61¹Cygni.....		50.6	22.0	42.8	4.8	26.2	48.0	9.6	21 0 4.72	.....	− 0.74	7.47	21 0 11.43	11.07
	ξ Cygni.....		27.5	48.0	8.0	26.8	48.0	6.0	26.0	21 6 26.90	.....	− 0.54	7.47	21 6 33.83	33.59
	ι Capricorni.....		51.4	9,5	28.4	44.8	3.0	20.6	38.0	21 13 44.81	.....	+ 0.30	7.47	21 13 52.58	52.67
26	η Ophiuchi.....	W.	45.5	3.0	20.5	38.4	56.0	13.5	31.5	17 1 38.34	.....	+ 0.51	+ 6.32	17 1 45.17	45.42
	α Herculis		49.0	6.8	23.8	41.8	59.5	16.8	34.5	17 7 41.74	.....	− 0.48	6.32	17 7 47.58	47.47
	Moon, 1st L		7.0	25.4	43.5	2.0	20.2	38.4	57.0	17 13 1.93	.....	+ 0.60	6.32	17 13 8.85	.....
	58 Ophiuchi.....		22.8	41.4	59.8	.....	36.0	.....	.....	17 33 55.00	+ 22.91	+ 0.73	6.32	17 34 24.96	25.42
	μ¹Sagittarii.....		.....	.....	21.5	39.8	57.8	.....	34.2	18 4 53.32	− 13.68	+ 0.71	6.32	18 4 46.67	46.43
	λ Sagittarii.....		37.8	57.0	16.0	35 0	53.8	12.5	31.4	18 18 34.80	.....	+ 0.88	6.32	18 18 42.00	41.65
	α Lyræ		41.5	3 5	24.5	46.5	8.4	30.0	52.0	18 31 46.63	.....	− 1.48	6.32	18 31 51.47	51.55
	μ¹²Sagittarii.....		3 6	22.0	40.0	58.6	17.5	35.5	54.0	18 44 58.74	.....	+ 0.78	6.32	18 45 5.84	5.73
	ξ Aquilæ.....		32.4	49.5	7.0	24.5	42.0	59.5	17.0	18 58 24.56	.....	− 0.45	6.32	18 58 30.43	30.45
27	η Ophiuchi.	W.	45.8	3.0	20.8	38.0	56.0	13.6	31.5	17 1 38.38	.....	+ 0.75	+ 6.30	17 1 45.43	45.40
	α Herculis		49.0	6.5	23.8	41.5	59.5	17.0	34.4	17 7 41.67	.....	− 0.70	6.30	17 7 47.97	47.45
	θ Ophiuchi.....		42.4	1.5	20.4	39.0	58.0	16.8	35.4	17 19 39.07	.....	+ 1.25	6.30	17 19 46.62	46.74
	α Ophiuchi.....		59.6	17.0	34 0	51.5	9.5	26.5	43.5	17 27 51.66	.....	− 0.61	6.30	17 27 57.35	57.36
	58 Ophiuchi.....		23.0	41.0	59.4	18.0	36.5	54.8	13.0	17 35 17.96	.....	+ 1.06	6.30	17 35 25.32	25.40
	4 Sagittarii.....		33.5	52.5	11.0	29.4	48.0	7.0	25.4	17 50 29.54	.....	+ 1.19	6.30	17 50 37.03	36.97
	Moon, 1st L		33.0	51.4	10.0	28.2	47.0	5.4	23.6	18 4 28.37	.....	+ 0.92	6.30	18 4 35.59	.....
	λ Sagittarii.....		37.5	56.8	15.0	34.0	53.4	12.0	30.5	18 18 34.17	.....	+ 1.98	6.30	18 18 41.75	41.64
	ξ Aquilæ.....		32.0	49.4	7.2	25.0	42.5	59.8	17.8	18 58 24.96	....	− 0.65	6.30	18 58 30.61	30.43
28	μ¹Sagittarii.....	W.	44.0	2.6	21.8	39.2	57.0	16.0	34.0	18 4 39.23	.....	+ 0.86	+ 6.28	18 4 46.37	46.40
	λ Sagittarii.....		.....	56.6	15.2	34.0	53.2	12.5	30.5	18 18 43.67	− 9.45	+ 1.06	6.28	18 18 41.56	41.62
	α Lyræ		41.2	3.4	25.2	46.8	9.0	30.6	52.5	18 31 46.96	.....	− 1.78	6.28	18 31 51.46	51.51
	Moon, 1st L.....		34.0	52.2	11.0	29.4	48.0	6.0	.....	18 56 20.10	+ 9.23	+ 0.76	6.28	18 56 36.37	.....
	π Sagittarii.....		.....	6.5	24.0	42.4	0.5	.....	.....	19 0 33.35	+ 9.14	+ 0.87	6.28	19 0 49 64	49.46
	γ Aquilæ.....		9.4	26.8	.....	.....	.....	.....	.....	19 38 18.10	+ 43.26	− 0.40	6.28	19 39 7.94	7.98
*29	4 Sagittarii.....	E.	33.4	52 4	11.0	29.4	48.2	6.8	25.2	17 50 29.51	.....	+ 0.78	+ 5.87	17 50 36.16	36.94
	μ¹Sagittarii.....		45.0	3.0	21.4	39.4	58.0	16.5	33.8	18 4 39.51	.....	+ 0.69	5.87	18 4 46.07	46.39
	λ Sagittarii.....		38.6	57.0	16.0	34.6	53.6	12.5	31.5	18 18 34.83	.....	+ 0.85	5.87	18 18 41.55	41.61
	α Lyræ.....		42.0	4.0	25.0	47.2	9.4	31.0	53.0	18 31 47.37	.....	− 1.49	5.87	18 31 51.82	51.59
	σ Sagittarii.....		.....	57.5	16.0	.....	.....	.....	29.0	18 55 34.17	0.00	+ 0.79	5.87	18 55 40.76	40.63
	ξ Aquilæ.....		.....	.....	.....	25.2	42.6	0.0	17.5	18 58 51.39	− 26.32	− 0.43	5.87	18 58 30.44	30.41
	φ Sagittarii.....		57 2	16.0	33.8	51.2	.....	.....	.....	19 12 24.55	+ 26.92	+ 0.58	5.87	19 12 57.92	57.37
	δ Aquilæ.....		57.8	15.2	31.8	.....	6.5	23.2	40.0	19 17 49.08	0.00	− 0.09	5.87	19 17 54.86	55.44
	γ Aquilæ.....		9.5	27.0	44.0	1.8	19.2	36.0	53.2	19 39 1.53	.....	− 0.39	5.87	19 39 7.08	7.98
	Moon, 1st L.....		56.8	15.4	34.0	52.6	11.5	30.0	48.0	19 48 59.61	.....	+ 0.57	5.87	19 49 05	.....
	α²Capricorni.....		21.0	38.0	56.0	13.5	31.0	.....	6.0	20 9 7.58	+ 5.63	+ 0.41	5.87	20 9 19.69	19.15
	α¹Capricorni.....		44.5	3.2	20.2	37.6	.....	.....	29.5	20 9 27.00	+ 10.51	+ 0.41	5.87	20 9 43.79	43.09
	β Capricorni.....		34.8	52.4	10.0	27.6	45.0	3.0	20.6	20 12 27.63	.....	+ 0.48	5.87	20 12 33.98	34.12
	α Cygni		3.3	27.0	50.0	15.0	39.2	3.5	27.5	20 36 15.07	.....	− 1.76	5.87	20 36 19.18	20.92
30	μ¹Sagittarii.....	W.	45.2	3.5	21.5	39.8	58.2	16.5	34.5	18 4 39.89	.....	+ 0.80	+ 5.48	18 4 46.17	46.37
	δ Ursæ Minoris...		.....	57.5	46,5	.....	.....	.....	.....	18 14 23.00	+7 11.69	− 35.14	5.48	18 21 5.03	4.23
	α Lyræ		42.6	4.8	26.0	47.8	9 8	31.0	53.0	18 31 47.66	.....	− 1.67	+ 5.48	18 31 51.67	51.47

* Instrument reversed.

Longitude of Camp Riley—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTION FOR— Imperfect transits.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	m. s.	m. s.	m. s.	h. m. s.	s.
Sept. 1	ϵ^1 Sagittarii	W.	.....	.....	.....	2.0	20.0	37.5	55.0	19 32 28.69	— 26.69	+ 0.66	+ 3.97	19 32 6.56	6.57
	γ Aquilæ		12.0	29.0	46.8	4.0	21.4	37.8	55.8	19 39 3.83	.....	— 0.40	3.97	19 39 7.40	7.27
	α Aquilæ		31.8	49.4	6.5	23.5	40.5	57.8	15.4	19 43 23.50	.....	— 0.33	3.97	19 43 27.14	27.29
	ζ^1 Sagittarii		27.8	45 5	3.2	21.2	39.0	57.0	14.5	19 49 21.17	.....	+ 0.63	3.97	19 49 25.77	25.69
	α Cygni		6.0	30.8	54.4	18.0	42.2	6.0	30.4	20 36 18.26	.....	— 2.19	3.97	20 36 20.04	20.01
3	π Sagittarii	W.	51.6	10.0	28.0	46.4	4.8	23.4	41.2	19 0 46.48	.....	+ 1.02	+ 1.98	19 0 49.48	49.38
	ρ^1 Sagittarii		0.2	18.4	36.5	54.5	12.4	30.0	48.4	19 12 54.34	.....	+ 0.86	1.96	19 12 57.16	57.30
	δ Aquilæ		2.5	19.4	36 0	53.4	10.5	27.2	44.4	19 17 53.34	.....	— 0.13	1.95	19 17 55.16	55.36
	γ Aquilæ		13.6	31.0	48.4	6.0	23.2	40.0	57.8	19 39 5.72	.....	— 0.47	1.94	19 39 7.19	7.22
	α Aquilæ		.....	51.2	8.8	26.0	42.6	0.4	17.4	19 43 34.40	— 8.62	— 0.39	1.93	19 43 27.32	27.35
	ζ Sagittarii		30.6	47.0	5.0	23.0	40.5	58.6	16.4	19 49 22.84	.....	+ 0.74	1.93	19 49 25.51	25.67
	α^1 Capricorni		24.0	41.5	59.0	17.0	34.0	51.6	9 2	20 9 16.61	....	+ 0.60	1.92	20 9 19.13	19.11
	α^2 Capricorni		48.0	5.2	23.0	40.0	57.5	16.0	33.0	20 9 40.39	.....	+ 0.60	1.92	20 9 42.91	42.98
	75 Draconis		.....	13.5	2.0	50.0	.....	25.0	13.5	20 38 32.80	— 43.08	— 16.31	1.90	20 37 35.31	35.50
	76 Draconis		31.5	32.4	35.2	36.6	39.2	40.4	43.0	20 53 36.90	.....	— 18.51	1 89	20 53 20.28	19.78
	β Cephei		23.5	19.5	1.8	52:0	42.0	31.0	21.0	21 26 51.97	.....	— 7.14	1.87	21 26 46.70	46.49
	7663		42.2	10.4	37.5	6.0	33.0	2.4	28.8	21 54 5.73	.....	— 13.24	1.85	21 53 54.34	50.33
	3495, S. P.		.....	.....	46.5	0.4	17.5	31.8	45.4	22 9 16.32	—3 16.23	+ 29.96	1.84	22 6 31.89	35.63
	λ Aquarii		53.0	10.4	27.4	44.6	2.0	19.2	36.2	22 44 44.69	.....	+ 0.38	1.81	22 44 46.88	46.84
	α Piscis Australis		18.0	37.5	57.8	17.2	36.5	56.2	16.6	22 49 17.12	.....	+ 1.53	1.81	22 49 20.46	20.56
	α Pegasi		23.4	41.4	58.8	16.5	34.0	51.5	9.0	22 57 16.37	.....	— 0.67	1.80	22 57 17.50	17.47
	ϕ Aquarii		39.0	56.4	13.4	30.4	47.6	4.8	22.4	23 6 30.57	.....	+ 0.31	1.79	23 6 32 67	32.82
	96 Aquarii		.....	.....	18.0	35.0	52.0	9.0	26.4	23 11 52.08	— 17.19	+ 0 27	1.78	23 11 37.01	36.83
	ι Piscium		21.6	37.8	55.2	12.5	29.8	47.0	4.2	23 32 12.58	.....	— 0.22	1.76	23 32 14.12	13.97
	90 Piscium		20.8	37.6	55.0	11.5	28.5	45.8	3.0	23 40 11.74	.....	+ 0.16	1.76	23 40 13.66	13.48
	97 Piscium		6.4	23.0	40.0	57.2	14.5	31.5	48.7	23 50 57.33	.....	+ 0.20	1.75	23 50 59.28	59 34
	33 Piscium		45.5	2.6	20.0	37.0	54.0	11.2	28.2	23 57 36.93	.....	+ 0.30	1.75	23 57 38.98	39.17
	α Andromedæ		.....	.....	18.8	38.0	57.5	17.0	.....	47.89	— 9.65	— 1.40	1.75	38.52	38.69
	γ Pegasi		36.6	54.8	12.2	29.4	47.4	4.8	22.5	5 29.67	.....	— 0.67	1.75	5 30.75	30.84
	Moon, 2d L.		11.5	28.5	46.4	4.0	21.5	38.5	56.4	12 3.83	.....	+ 0.06	1.74	12 5.63	.....
	10 Ceti		.....	.....	37.0	54.0	11.0	28.0	45.0	19 11.00	— 17.03	+ 0.04	1.74	19 55.75	55.53
	13 Ceti		38.0	55.2	12.4	29.6	46.5	3.6	21.0	27 29.90	.....	+ 0.20	1.73	27 31.83	31.17
	β Ceti		6.5	24.5	42.0	.....	18.5	35.8	.....	35 51.22	+ 9.00	+ 0 09	1.73	36 2.84	2.91
	δ Piscium		1.0	18.4	35.5	52.5	10.0	27.0	44.0	40 59 64	.....	— 0.31	1.72	40 54.05	53.67
	90 Ceti		27.0	44.0	1.0	18.5	35.4	52.4	10.0	45 18.33	.....	+ 0.09	1.71	45 20.13	20.19
	Polaris		.....	.....	24.0	26.4	17.0	13.0	12.6	1 18 18.60	—10 53.80	—1 40.00	1.70	1 5 46.50	50.78
4	97 Piscium	W.	7.4	24.4	41.4	59.6	16.0	32.5	49.8	23 50 58.59	.....	+ 0.19	+ 0 55	23 50 59.33	59.35
	33 Piscium		47.0	4.0	21.4	38.0	55.5	12.6	29.6	23 57 38.30	.....	+ 0.28	0.54	23 57 39.12	39.10
	γ Pegasi		38.0	55.6	13.4	31.0	48.5	6.2	23 6	5 30.90	.....	— 0.02	0.54	5 30.82	30.83
	10 Ceti		4.0	21.8	38.4	55.2	12 4	29.0	46.0	18 55.36	.....	+ 0.04	0.50	18 55.82	55.54
	13 Ceti		39.4	56.4	13.5	30.6	47.6	5.0	.....	27 22.08	+ 8.55	+ 0.19	0.51	27 31.33	31.18
	β Ceti		8.0	25.6	43.4	2.0	20.0	37.4	55.4	36 1.70	....	+ 0.83	0.51	36 3.04	2.93
	δ Piscium		2.4	19.4	36.4	53.8	11.0	28.0	45.0	40 53.71	.....	— 0.29	0.50	40 53.92	53.86
	ϵ Piscium		18.0	35.0	52.0	9.4	26.4	43.4	0.6	55 9.96	.....	— 0.30	0.49	55 9.45	9.34
	ϵ Piscium		46.8	4.0	20.4	38.0	55.0	12.4	29.6	1 0 38.17	.....	— 0.21	0.49	1 0 38.45	39.05
	Moon, 2d L.		.....	24.0	41.5	59.0	16.5	34.0	51.4	1 5 7.73	— 8.73	— 0.13	0.48	1 4 59.35	.....
	μ Piscium		27.8	44.8	2.0	19.0	36.0	53.4	10.6	1 22 19.09	.....	— 0.23	0.46	1 22 19.32	19.16
	ν Piscium		45.8	2.8	20.0	36.8	54.0	11.2	28.0	1 33 36.94	.....	— 0.21	0.45	1 33 37.18	37.19
	o Piscium		.....	.....	11.0	28.0	45.4	2.8	20.0	1 37 45.44	— 17.21	— 0.36	0.45	1 37 28.32	27.94
	ϕ Phœnicis		.....	.....	41.5	5.0	28.5	52.0	15.0	1 48 28.40	— 23.37	+ 2.28	0 44	1 48 7.75	8.00
	α Arietis		48.0	6.8	25.0	43.5	2.0	20.0	38.5	1 58 43.40	.....	— 1.02	0.43	1 58 42.81	43.07
	μ Persei		15.4	35.5	55.0	15.4	34.4	55.0	15.5	2 6 15.31	.....	+ 1.48	0.42	2 6 17.21	17.34
*5	10 Ceti	W.	12.4	28.6	46.0	2.8	19.6	37.0	54.0	15 43 2.91	.....	+ 0.04	+8 35 52.69	18 55.84	55.55
	13 Ceti		46.0	2.4	20.0	37.0	54.0	11.2	28.0	15 51 36.94	.....	+ 0.21	35 54.30	27 31.45	31.19
	Polaris		.....	47.6	30.8	94.0	.....	.....	.....	16 20 30.80	+10 51.96	—1 44.00	36 0.58	1 5 39.34	51.68
	θ^1 Ceti		36.4	54.0	11.0	28.4	45.2	2.6	20.0	16 40 28.22	.....	+ 0.43	36 9.30	1 16 30.97	31.07
	μ Piscium		25.0	42.0	59.0	16.0	33.4	50.4	7.6	16 46 16.20	.....	— 0.26	36 3.97	1 22 19.21	19.17
	ν Piscium		41.0	58.2	15.2	32.4	49.4	6.6	23.6	16 57 32.34	.....	— 0.22	+ 36 5.13	1 33 37.25	37.20

* Observed with mean-time chronometer No. 76.

Longitude of Camp Riley—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTION FOR— Imperfect transits.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	s.	s.	h. m. s.	h. m. s.	s.
Sept. 5	ε Piscium	W.	31.2	48.2	5.8	23.0	40.0	57.2	14.0	17 1 22.77		— 0.40	+ 36 5.75	1 37 28.12	27.95
	Moon, 2d L.		5.0	22.0	39.5	57.4	15.0	32.0	50.0	17 29 57.27		— 0.36	36 9.35	1 59 6.16	
	ξ¹ Ceti		1.2	18.2	35.2	52.6	9.8	27.0	44.0	17 28 52.57		— 0.39	+ 8 36 10.27	2 5 2.45	2.74
	713 B. A. C.			2.0	23.4	44.4	5.4	27.0	48.0	17 34 55.03	— 10.60	+ 2.09	36 11.94	2 10 57.69	58.46
	ξ²Ceti		7.0	23.4	40.6	57.8	15.2	32.4	49.4	17 43 57.97		+ 0.37	36 12.75	2 20 10.35	10.73
	783 B. A. C.		43.2	4.6	26.0	47.3	8 5	30.0	51.2	17 49 47.94		+ 2.05	36 13.72	2 26 3.01	4.09
	ι Eridani		19.0	41.5	4.0	26.5	48.6	11.4	33.4	17 58 26.34		+ 2.32	36 15.14	2 34 43.80	44.55
*7	δ Ursæ Minoris	W.	21.0	9.0	57.8		31.5	19.0	8.6	18 21 44.48					
	51 (Hev.) Cephei		33.5		24.0	20.0		12.0	6.4	18 28 31.18					
	6625 B. A. C.		19.0	30.5	42.4	55.0	7.0	18.8	31.0	19 14 54.81					
	λ Ursæ Minoris		17.6	42.5	7.0	30.4	49.2	11.2	45.2	20 16 29.01					
†17	γ¹ Sagittarii	W.	10.8	30 0	49.2	7.6	26.4	44.0	3.2	18 45 7.33					
	ξ¹ Sagittarii		53.5	11.5	29.3	48.0	6.0	24.2	42.0	18 48 47.80					
	ε Sagittarii		47.0	5.8	24.0	42.0	0.4	18.6	37.0	18 55 42.11					
	ξ Aquilæ							6.0	23.5	18 57 14.75					
	δ Aquilæ		5.2	22.4	39.4	56.5	13.8	30.6	47.8	19 17 56.53					
	β Cygni		41.8	1.5	21.0	40.2	59.6	18.8	38.0	19 24 40.13					
	π² Sagittarii		38.4	58.0	16.8	35.4	54.0	13.4	31.8	19 27 35.40					
	α Aquilæ					27.5	45.0	2.0	19.8	19 43 53.58					
	σ Sagittarii		29.0	48.4	8.0	27.0	46.5	6.0	24.8	19 53 27.10					
18	ξ Aquilæ	W.	39.6	57.2	15.0	32.4	50.0	7.8	25.0	18 58 32.43					
	β¹ Sagittarii		40.0	4.0	27.6	52.4		40.2	4.0	19 10 8.03					
	β Cygni		44.0	3.6	23.0	41.8	1.6	20.6	39.8	19 24 42 06					
	γ Aquilæ		17.8	35.0	52.4	9.6	27.0	44.0	1.4	19 39 9.60					
	37 Sagittarii			54.0	12.2	30.4	48.4	6.5	24.5	19 43 39.33					
	α² Capricorni		53.2	10.0	27.4	45.0	2.6	20 0	37.2	20 9 45.06					
	π Capricorni			8.8	27.0	45.2	3.0	21.0	38.6	20 18 53.93					
	γ Capricorni		37.5	55.5	13.8	31.5	49.5	8.0	25.8	20 31 31.61					
	α Cygni		9.2	33.5	57 5	22,0	45.8	9.8	33.5	20 36 21.62					
	μ Aquarii		43.5	1.0	18.0	35.0	52.4	10.0	27.0	20 44 35.27					
	η Capricorni		58.7	17.0	34.8	53.2	11.5	29.5	47.8	20 55 53.21					
	ζ Cygni		36.0	56.0	15.5	35.3	55.0	14.7	34.0	21 6 35.20					
‡20	δ Ursæ Minoris	E.	35.2	25.2	10.4	57.2				18 13 47.00					
	δ Ursæ Minoris	W.					47.2	31.2	22.4	18 30 33.60					
	γ¹ Sagittarii		16.5	34.5	53.0	12.0	30.0	48.8	7.4	18 45 11.74					
	ξ Aquilæ		44.0	1.6	19.0	36.4	54.4	12.0	29.0	18 58 36.63					
	β¹ Sagittarii		43.4	7.8	31.4	56.0	20.0	44.0	7.6	19 11 55.74					
	δ Aquilæ		10.6	27.6	44.8	2.0	19.0	35.5	53.0	19 18 1.79					
	β Cygni		48.5	6.0	27.0	46 4	5.8	24.8	44.0	19 24 46.36					
§22	Moon, 1st L.	W.	16.6	34.4	53.2	11.4	29.6	48.0	6.4	7 10 11.37					
23	Moon, 1st L.	W.	26.0	44.4	3.4	21.4	39.8	58.4	16.8	7 57 21.46					
24	λ Sagittarii	W.	34.8	53.6	12.4	31.2	50.0	8.8	29.6	8 28 31.90		— 0.66	+ 9 50 10.66	18 18 41.90	41.13
	Moon, 1st L.		59.4	18.6	36.4	54.8	13.4	32.0	50.0	8 44 54.94		— 0.48	9 50 13.35	18 35 7.81	
	ρ¹ Sagittarii		55.6	13.6	32.0	50.8	9.2	28.6	46.0	8 54 50.83		— 0.59	9 50 14.99	18 45 5.23	5.25
	σ Sagittarii		29.2	46.6						9 4 37.90	+ 45.77	— 0.56	9 50 16.72	18 55 39.83	40.09
	α Aquilæ		10.8	28.0	45.2	2.4	19.6	36.8	53.4	9 53 2.32		+ 0.21	9 50 24.55	19 43 27.08	27.05
27	ξ Aquilæ	W.			0.4	18.0	35.2	52.8	10.2	8 56 35.24	— 17.47	+ 0.35	10 2 11.72	18 58 29.81	29.92
	β¹ Sagittarii		24.2	48.0	12.0	35.6	59.6	23.6	48.6	9 9 35.94		— 0.97	10 2 13.90	19 11 48.78	48.88
	δ Aquilæ		49.0	6.4	23.0	40.0	57.2	14.0	30.8	9 15 40.06		+ 0.11	10 2 14.90	19 17 55.08	55.01
	β Cygni		25.2	44.8	3.6	22.8	42.0	1.2	20.0	9 22 22.80		+ 0.61	10 2 6.09	19 24 39.42	39.78
	λ² Sagittarii		20.8	39.6	58.4	16.8	35.8	54.4	13.2	9 25 17.00		— 0.42	10 2 16.47	19 27 33.05	33.09
	γ Aquilæ		56.4	13.8	30.8	48.0	5.0	22.0	39.6	9 36 47.94		+ 0.25	10 2 18.37	19 39 6.57	6.86
‡	β Capricorni	E.	16.8	35.2	58.2	10.4	28.0	45.6	3.2	10 10 10.34		— 0.34	10 2 23.85	20 12 33.85	33.68
	π Capricorni					18.4	36.0	54.2	12.0	10 16 45.15	— 27.01	— 0.41	10 2 24.86	20 18 42.59	42.82
	ν Capricorni		9.0	27.4	44.4	2.4	20.8	38.0	56.4	10 29 2.63		— 0.41	+10 2 26.95	20 31 29.17	29.46

* Resumed sidereal chronometer No. 420. † Instrument adjusted in azimuth. ‡ Instrument reversed. § Mean-time chronometer No. 78.

Longitude of Camp Riley—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTION FOR— Imperfect transit.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	s.	s.	h. m. s.	h. m. s.	s.
Sept. 27	ε Aquarii	E.	12.4	30.0	47.2	4.4	21.6	38.8	56.0	10 37 4.34	.....	— 0.94	+10 2 28.27	20 39 32 37	32.20
	μ Aquarii		12.0	29.6	46.8	4.0	21.6	.....	55.4	10 41 58.23	+ 6.38	— 0.60	10 2 29.09	20 44 33.10	32 85
	η Capricorni		25.6	44.0	2.0	20.4	38.4	56.4	14.8	10 53 20.33	.....	— 0.40	10 2 30.94	20 55 50.72	50.81
	ν Aquarii		0.8	18.0	35.6	52.8	10.4	27.6	44.8	10 58 52.86	.....	— 0.28	10 2 31.85	21 1 24.43	24.33
	ξ Cygni		1.4	20.8	40.4	0.0	19.8	39.2	58.4	11 4 0.00	.....	+ 0.53	10 2 32.69	21 6 33.22	33.25
	* Moon, 1st L		40.4	58.4	16.4	34.4	52.4	10.2	28.0	11 8 34.31	.....	— 0.21	10 2 33.44	21 11 7.54	.....
28	ξ Cygni	W.	3.2	22.4	42.4	2.4	21.6	40.8	0.8	11 0 1.94	.....	+ 0.45	+10 6 30.85	21 6 33.24	33.23
	ι Capricorni		27.4	45.0	2.8	20.5	38.4	56.0	14.0	11 7 20.59	.....	— 0.25	10 6 32.05	21 13 52.39	52.38
	β Aquarii		14.0	31.6	48.0	5.4	22.4	39.6	.....	11 16 56.83	+ 8.55	— 0.09	10 6 33.66	21 23 38.95	38.96
	Moon, 1st L		34.0	52.8	10.8	28.0	46.8	3.6	22.4	11 56 28.34	.....	— 0.16	10 6 39.89	22 3 8.07	.....
29	ξ Cygni	W.	.....	24.8	45.0	3.8	23.6	43.2	2.4	10 56 13.80	— 9.76	+ 0.64	+10 10 26.54	21 6 33.32	33 21
	β Aquarii		16.0	33.0	50.0	.....	24.4	41.2	58.0	11 13 7.10	0.00	— 0.19	10 10 31.35	21 23 38.33	38.95
	γ Capricorni		20.0	37.8	55.4	13.6	31.2	49.2	6.8	11 21 13.43	.....	— 0.35	10 10 32.68	21 31 45.76	45.71
	δ Capricorni		18.0	36 0	53.6	11.6	29.2	46.8	4.8	11 28 11.43	.....	— 0.34	10 10 33.83	21 38 44.92	44.65
	ι Aquarii		49.8	7.6	24.8	42.4	0.0	17.8	35.2	11 47 49.51	.....	— 0.29	10 10 37.65	21 58 19.27	19.27
	θ Aquarii		24.2	41.6	58.8	16.0	33.2	50.0	7.6	11 58 15.91	.....	— 0.17	10 10 38.78	22 8 54.50	54.42
	γ Aquarii		23.4	40.4	57.6	14.8	31.6	48.4	5.6	12 3 14.54	.....	— 0.04	10 10 39.60	22 13 54.10	54.07
	σ Aquarii		8.6	26.0	43.6	1.0	18.0	35.6	53.2	12 12 0.90	.....	— 0 23	10 10 41.05	22 22 41.72	41.78
	ξ Pegasi		24.0	41.6	58.8	16.0	33.2	50.4	7.6	12 23 15.80	.....	— 0.50	10 10 43.90	22 33 58.98	58.77
	λ Aquarii		10.8	28.0	45.2	2.4	19.6	36.8	54.0	12 34 2.40	.....	— 0.17	10 10 44.68	22 44 46.91	46.84
	α Piscis Australis		36.8	56.4	16.0	33.6	55.0	15.2	35.0	12 38 35.80	.....	— 0.66	10 10 45.43	22 49 20.57	20.56
	Moon, 1st L		38.0	55.8	13.6	31.0	48.8	6.4	23.8	12 44 31.06	.....	— 0.15	10 10 46.13	22 55 17.04	.....
	ψ³ Aquarii		28.4	45.6	3.0	20.4	37.6	54.8	12.0	13 0 20.26	.....	— 0.21	10 10 49.01	23 11 9.06	9.04
†30	λ Aquarii	E.	13.2	30.8	47.8	5.0	22.4	39.6	56.8	12 30 5.09	....	— 0.18	+10 14 42.18	22 44 47.09	46.85
	α Piscis Australis		38.8	58.4	18.4	38.0	58.0	17.6	37.4	12 34 38.09	.....	— 0.71	10 14 42.93	22 49 20.31	20.56
	α Pegasi		40.0	58.0	15.6	33 0	50.4	8.0	25.6	12 43 32.94	.....	+ 0.31	10 14 44.94	22 57 17.49	17.49
	Moon, 1st L		7.2	24.8	42.0	59.4	17.0	34.0	51.6	13 39 59.43	.....	— 0.07	10 14 52.94	23 47 51.66	.....
Oct. 4	α Arietis	E.	42.4	0.8	18.8	37.2	55.6	14.0	32.4	15 27 37.31	.....	.....	.....	.....	.....
	ξ¹ Ceti		4.8	22.0	38.8	56.0	13.2	30.2	47.4	15 33 56.06	.....	.....	.....	.....	.....
	ξ² Ceti		10.8	27.6	44.4	1.6	18.4	36.0	52.8	15 49 1.66	.....	.....	.....	.....	.....
	783		50.0	.....	32.4	.....	.....	.....	.....	15 54 11.20	.....	.....	.....	.....	.....
	γ Ceti		.....	.....	.....	48.8	6.0	23.6	40.4	15 57 14.70	.....	.....	.....	.....	.....
	839		25.2	48.0	10.4	32.4	54.8	17.6	39.6	16 3 32.57	.....	.....	.....	.....	.....
	π Arietis		49.6	6.8	24.0	41.8	59.6	17.8	35.2	16 9 42.11	.....	.....	.....	.....	.....
‡	α Ceti		.....	38.0	.....	.....	.....	.....	.....	38.00	.....	.....	.....	.....	.....
5	γ Aquilæ	E.	.....	30.8	48.0	5.2	22.4	39.6	56.4	9 5 13.73	.....	.....	.....	.....	.....
	α Aquilæ		32.8	50.0	7.6	24.8	42.0	.....	16.0	9 9 16.87	.....	.....	.....	.....	.....
	ζ¹ Sagittarii		29.2	46.8	4.4	21.6	39.6	57.2	14.8	9 15 21.94	.....	.....	.....	.....	.....
§8	α Cygni		2.8	25.8	50.4	14.4	39.2	2.4	26.0	9 50 14.57	.....	.....	.....	.....	.....
23	γ Aquilæ	E.	50.0	7.6	24.4	41.6	59.2	16.4	33.6	7 53 41.83	.....	— 0.17	+11 45 24.82	19 39 6.48	6.38
	α Aquilæ		9.6	26.4	44.0	0.8	18.0	35.6	52.6	7 58 1.00	.....	— 0.14	11 45 25.53	19 43 26.39	26.53
	ζ¹ Sagittarii		.....	22.8	40.4	58.0	16.0	33.4	50.8	8 4 6.90	— 8.84	+ 0.27	11 45 26.51	19 49 24.86	24.88
	Moon, 1st L		54.0	12.4	30.8	49.2	7.6	25.6	44.6	8 11 49.14	.....	+ 0.30	11 45 27.80	19 57 17.94	.....
	α² Capricorni		20.0	37.6	54.4	12.0	29.6	47.0	4.4	8 24 12.14	.....	+ 0 22	11 45 29.67	20 9 42.03	42.23
	β Capricorni		9.8	27.4	45.2	2.6	20.4	38.0	55.6	8 27 2 71	.....	+ 0.25	11 45 30.31	20 12 33.27	33.34
	π Capricorni		16.8	34.8	52.8	10.8	28.8	46.8	4.4	8 33 10.74	.....	+ 0.32	11 45 31.31	20 18 42.37	42.38
	ν Capricorni		1.6	19.6	37.2	55.0	13.2	31.2	49.2	8 45 55.28	.....	+ 0.39	11 45 33.40	20 31 29.00	29.03
†25	μ Aquarii	W.	7.2	24.8	42.4	59 2	16.6	33.6	50.8	8 50 59.23	.....	+ 0.24	+11 53 33.20	20 44 33.67	32.42
	η Capricorni		20.4	38.8	57.0	14.8	33.2	51.2	9.2	9 2 14.94	.....	+ 0.53	11 53 35.04	20 55 50.51	50.36
	ν Aquarii		56.0	13.2	30.0	48.0	5.4	22.4	39.6	9 7 47.80	.....	+ 0.30	11 53 35.95	21 1 23.05	23.91
	29 Capricorni		55.0	12.8	30.4	48.0	5.8	23.2	40.8	9 13 48.00	.....	+ 0.31	11 53 36.92	21 7 25.23	25.23
	ι Capricorni		20.0	38.0	55.8	13.8	31.6	49.4	7.2	9 20 13.69	.....	+ 0.45	11 53 37.96	21 13 52.10	52.06
	β Aquarii		7.3	24.4	41.2	58.8	16.0	32.8	.....	9 29 50.08	+ 8.55	+ 0 16	11 53 39.54	21 23 38.33	38.58
	γ Capricorni		10.4	28 0	46.0	4.0	22.0	39.6	57 2	9 38 3.90	.....	+ 0.45	11 53 40.85	21 31 45.20	45.35
	Moon, 1st L		11.0	29.2	47.2	5.2	23.8	40.4	58.8	9 46 4.95	.....	+ 0.33	11 53 42.23	21 39 47.51	.....
	ι Aquarii		40.0	58.0	15.6	33.2	50.8	8.4	26.0	10 4 33.14	.....	+ 0.37	+11 53 45.19	21 58 18.70	18.95

* Interrupted by dense clouds. † Instrument reversed. ‡ Interrupted by clouds. § Sky obscured by dense clouds.

Longitude of Camp Riley—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTION FOR— Imperfect transits.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	s.	s.	h. m. s.	h. m. s.	s.
Oct. 26	μ Aquarii	W.	11.2	28.4	46.0	2.8	20.4	37.2	54.4	8 39 2.91		+ 0.94	+12 5 29.70	20 44 32.85	32.37
	ψ Capricorni		24.4	42.8	0.8	18.8	37.2	54.8	13.2	8 50 18.86		+ 0.53	12 5 31.55	20 55 50.94	50.31
	ξ Cygni		1.6	21.2	40.8	0.4	20.0	39.6	59.2	9 1 0.40		— 0.81	12 5 33.98	21 6 39.87	39.67
	29 Piscium		24.4	41.6	58.4	15.6	32.4	49.2	6.4	11 34 15.43		+ 0.09	12 5 58.94	23 40 13.76	13.51
	27 Piscium		8.4	25.2	42.2	59.2	16.4	33.6	50.4	11 44 59.34		+ 0.11	12 5 59.98	23 50 59.43	59.43
	α Andromedæ				18.8	38.4	57.6	16.8	36.0	11 54 57.52	— 19.28	— 0.77	12 6 1.54	39.01	38.80
	γ Pegasi		36.4	53.6	11.6	29.2	46.4	4.0	21.6	11 59 28.97		— 0.37	12 6 2.33	5 30.93	30.98
	Moon, 1st L.		26.8	44.0	2.0	19.2	36.8	54.4	11.6	12 9 19.98		+ 0.03	12 6 3.95	15 23.94	
	10 Ceti			17.2	34.4	51.2	8.0	25.2	42.0	12 12 51.14		+ 0.09	12 6 4.59	18 55.68	55.76
	13 Ceti		34.0	51.2	8.0	25.2	42.8	59.6	16.4	12 21 25.31		+ 0.11	12 6 5.91	27 31.33	31.45
	δ Piscium		54.4	11.6	28.8	46.0	3.2	20.4	37.6	12 34 46.00		— 0.17	12 6 8.09	40 53.92	54.22
	20 Ceti		20 2	37.2	54.4	11.6	28.4	45.2	2.4	12 39 11.34		+ 0.05	12 6 8.79	45 20.18	20.56
29	δ Piscium	W.	57.2	14.2	31.6	48.8	5.6	23.2	39.8	12 30 48.63		— 0.17	+12 10 5.60	40 54.06	54.21
*	20 Ceti	E.	22.8	39 6	57.0	14 4	31.2	48.0	4.8	12 35 14.00		+ .05	12 10 6.33	45 20.38	20.56
	ϵ Piscium		10.6	27.6	45.0	2.0	19.2	36.0	53 2	12 45 2.00		+ 0.18	12 10 7.94	55 10.12	9.76
	Moon, 1st L.		25.0	52.4	9 2	26.8	44.4	2.4	19.2	12 59 27.06		— 0 09	12 10 10.31	1 9 37.28	
	θ^1 Ceti		28.0	45.4	2.4	19.6	36.8	54.4	11.6	13 6 19.74		+ 0.23	12 10 11.44	1 16 31.41	31.57
	μ Piscium		16.4	33.6	50.4	7.6	24.8	41.6	58.8	13 12 7.63		— 0.13	12 10 12.39	1 22 19.89	19.71
	ν Piscium		32.4	49.8	6.4	23.6	40.8	58.0	14.8	13 23 23.69		— 0.12	12 10 14.94	1 33 37.81	37.80
	o Piscium		22.4	40.0	57.2	14.4	31.6	48.8	6.0	13 27 14.34		— 0.21	12 10 14.87	1 37 29.00	28.77
Nov. 1	ξ Tauri	W.	45.2	1.6	19.0	36.0	53.6	11.2	28.4	14 56 36.43		— 0.23	+12 22 26.82	3 19 3.02	2.80
	e Tauri		41.2	58.8	15.6	33.2	50.4	8.0	25.2	15 17 33.20		— 0.27	12 22 30.26	3 40 3.19	3.12
	λ Tauri		58.0	16.0	33.2	50.4	8.0	25.2	42.4	15 29 50.46		— 0.31	12 22 39.28	3 52 22.43	22.59
	Moon, 2d L.		28.8	47.2	5.2	23.6	41.6	59.6	17.8	15 46 23.40		— 0.41	12 22 35.00	4 8 57.99	
	ϵ Tauri		21.2	39.4	57.6	15.6	33.4	51.2	9.6	15 57 15.43		— 0.49	12 22 36.76	4 19 51.72	51.69
	α Tauri		48.4	6.0	23.8	41.6	59.2	17.0	34.4	16 4 41.49		— 0.49	12 22 34.01	4 27 19.08	19.09
2	ξ Tauri	W.	22.8	40.8	59.2	17.2	34.8	52.8	10.8	15 53 16.92		— 0.49	+12 26 35.87	4 19 52.30	51.83
	α Tauri		50.0	7.8	24.8	42.6	0.2	18.0	35.8	16 0 42.77		— 0.42	12 26 37.09	4 27 19.44	19.11
	o^1 Orionis		30.8	48.4	6.0	23.6	41.2	58.4	16.0	16 17 23.50		— 0.36	12 26 39.83	4 44 2.97	3.02
	ι Tauri		32.0	50.6	8.8	26.8	45.2	3.2	21.6	16 27 26.89		— 0.56	12 26 41.48	4 54 7.81	7.92
	11 Orionis				0.4	18.4	36.2	53.4	11.0	16 29 35.88	— 17.59	— 0.39	12 26 41.79	4 55 59.69	60.03
	β Orionis		44.0	1.4	18.4	35.6	52.8	10.0	27.2	16 40 35.63		+ 0.21	12 26 43.65	5 7 19.49	19.81
†	Moon, 2d L.		58.4	16.8	35.2	53.6	12.0	30.4	48.8	16 45 53.60		— 0.47	12 26 44.54	5 12 37.67	
*3	68 Geminorum	E.	9.2	27.2	44.8	2.2	20.0	38.0	55.2	18 46 2.37		0.00	+12 39 5.05	7 25 1.04	1.99
	α Canis Minoris		34.0	51.6	8.4	25.6	42.8	58.8	16.8	18 52 25.43		0.00	12 39 0.06	7 31 26.06	26.09
	β Geminorum			26.8	44.0	5.2	24.6	44.0	3.4	18 57 15.00	— 9.67	0.00	12 39 1.39	7 36 6.72	6.90
	15 Argus		7.8	26.4	45.2	3.8	22.4	40.4	59.4	19 22 3.63		0.00	12 39 5.49	8 1 9.12	8.99
	d^1 Cancri		43.4	1.6	19.6	37.4	55.6	13.4	31.2	19 35 37.46		0.00	12 39 7.72	8 14 45.18	45.09
	Moon, 2d L.		50.8	9.2	27.2	45.2	3.6	22.0	40.2	19 43 45.46		0.00	12 39 9.06	8 22 54.52	
	δ Cancri		2.8	21.2	39.2	56.8	14.8	33.2	50.8	19 56 56.97		0.00	12 39 11.22	8 36 8.19	8.13
	ϵ Hydræ		45.8	2.8	19.8	37.2	54.4	11.6	28.4	19 59 37.14		0.00	12 39 11.66	8 38 48.80	48.73
	α Cancri		9.6	27.2	44.4	2.0	19.2	36.8	54.0	20 11 1.90		0.00	+12 39 13.54	8 50 15.44	15.52
6	δ Cancri	E.	2.4	20.4	38.4	56.4	14.0	32.4	50.4						
	α Cancri		9.2	27.4	44.0	1.2	18.8	36.4	53.2						
	α Hydræ		1.2	18.8	35.6	52.8	10.0	27.2	44.4						
29	30 Piscium	E.	3.2	20.0	36.8	54.0	10.8	28.0	45.2						
	α Andromedæ		18.0	37.6	56.8	16.0	35.2	55.2	13.6						
	γ Pegasi		14.8	32.8	50.0	7.2	25.2	42.8	0.4						
	10 Ceti		38.8	56.0	13.2	30.0	47.2	4.0	20.8						
	13 Ceti		19.8	37.0	47.2	4.0	21.2	38.4	55.2						
	β Ceti		40.0	57.6	16.0	33.6	51.6	9.6	27.6						

* Instrument reversed.

† Wire VI indistinct.

From the "Greenwich Observations" for 1849 we obtain the following observed corrections of the AR. of the moon's bright limb:

			s.
July	27	1st L.	— 0.51
	28		.55
	29		.48
	30		.48
	31		.26
Aug.	1		.44
	3		.18
	3	2d L.	.73
	4		.38
	6		.38
	8		.54
	11		.62
Aug.	23	1st L.	— 1.22
	24		.68
	29		.46
	31		.47
Sept.	5	2d L.	.22
	8		.41
	9		.51
Sept.	22	1st L.	— 0.68
	25		.15
	26		.22
	30		.56
Oct.	2	2d L.	.67
	4		.65
	5		.47
	8		.32
	9		.67
Oct.	28	1st L.	.60
	29		.67
	31		.73
Nov.	1	2d L.	.50
	4		.60
	5		.74

Longitude of Camp Riley by corresponding observations.

	h.	m.	s.		h.	m.	s.		h.	m.	s.
July 27	7	48	37.98	Aug. 3	7	48	51.51	Oct. 28	7	48	24.48
28			23.51	29			39.97	29			15.13
29			7.45	Sept. 5			6.99	Nov. 1			13.41
30			37.60	30			18.27	5			25.37
31			39.29								

	h.	m.	s.
Mean	7	48	24.70
Probable error of result =			± 2.32
Probable error of single observation =			± 8.05

The following have been adopted as corrections for the respective lunations:

	s.		s.
July 27 to August	— 0.47	September 22 to October	— 0.48
August 23 to September	— 0.54	October 28 to November	— 0.63

Applying these corrections to the computed AR. of the moon's limb for each date of observation, and comparing with the observed AR., we obtain:

		h.	m.	s.		h.	m.	s.		h.	m.	s.
July	27	7	48	36.81	Aug. 28	7	48	21.77	Sept. 30	7	48	17.78
	28			20.90	29			44.89	Oct. 23			34.80
	29			6.88	Sept. 3			9.77	25			22.50
	30			37.32	[illegible]			18.54	28			25.02
	31			45.08	5			15.12	29			14.09
Aug.	2			29.28	24			41.90	Nov. 1			16.17
	3			39.60	27			34.61	2			18.00
	26			23.07	28			22.98	5			22.75
	27			36.91	29			21.85				

	h.	m.	s.
Mean	7	48	25.98
Longitude of Camp Riley, computed in the field from the predicted place of the moon in the Greenwich ephemeris for 1849	7	48	13.1
Difference			12.88

	s.
Probable error of a single observation	± 7.21
Probable error of result	± 1.44

II.—*Longitude of junction of the Gila and Colorado: By Lieut. A. W. Whipple.*

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTIONS FOR— Imperfect transits.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	s.	s.	m. s.	h. m. s.	s.
Oct. 3	α Arietis	E.	5.5	24.5	44.5	3.0	22.0	40.0	59.5	1 58 2.71		− 0.56	+ 0 41.83	1 58 43.98	43.62
	44 Ceti		52.0	9.5	27.0	45.0	3.0	20.5	38.0	2 2 45.00		0.15	41.83	2 3 26.68	26.28
	Moon, 2d L.		52.0	10.5			5.0	23.5	42.0	2 33 50.60	− 3.64	0.23	41.81	2 34 28.54	
	α Ceti		52.0	10.0	27.5	44.5	2.0	20.0	37.5	2 53 44.79		0.08	41.89	2 54 26.51	26.33
	δ Arietis		25.5	44.5	3.5	21.5	40.5	59.5	17.5	3 2 21.79		0.46	41.79	3 3 3.12	3.33
	α Persei		37.0	4.0	31.0	57.5	24.5	52.0	19.0	3 12 57.86		1.56	41.78	3 13 38.09	38.40
	ξ Tauri		27.5	45.0	3.5	21.0	38.5	56.5	14.5	3 18 20.93		0.22	41.76	3 19 2.47	2.32
4	μ Ceti		18.0	35.5	53.5	11.5	29.5	46.5	5.0	2 36 11.36		− 0.17	+ 0 39.81	2 36 50.30	50.11
	α Ceti		54.5	13.5	29.5	46.5	5.0	22.5	40.0	2 53 47.36		0.06	39.09	2 54 26 39	26.35
	δ Arietis		29.0	47 5	6.0	25.0	43.5	2.0	20.5	3 2 24.79		0.36	39.08	3 3 3.51	3.34
	α Persei			7.0	34.0	0.0	27.0	54.5	22 0	3 13 14.08	− 13.50	1.19	39.07	3 13 38.46	38.43
	ξ Tauri		30.0	48.0	5.5	23.0	41.0	59.0	17.0	3 18 23.34		0.17	39.06	3 19 2.23	2.34
	ε Tauri		40.0	58.0	16.5	34.0	51.5	9.5	28.0	3 21 33.93		0.20	39.05	3 22 12.78	12.66
	Moon, 2d L.		30.0	49.0	7.5	26.0	44.5	3.0	21.0	3 32 25.86		0.25	39.04	3 33 4.65	
	ε Tauri						41.0	59.5	17.5	3 39 59.33	− 35.74	0.19	39.03	3 40 2.43	2.60
	λ Tauri		49.5	7.0	25.0	43.0	1.0	19.0	37.0	3 51 43.07		0.22	39.01	3 52 21.86	22.04
5	α Arietis	E.	45.0	4.5	23.5	42.0	1 5	20.5	39.5	1 46 42.36		− 0.67	+ 12 2.06	1 58 43.75	43.65
	ξ¹ Ceti		8.5	26.5	44.0	1.5	19.5	37.5	55.0	1 53 1.79		0.51	2.06	2 5 3.34	3.12
	α Ceti		31.5	49.5	7.0	24.5	42.5	59.5	17.5	2 42 24.57		0.48	2.06	2 54 26.15	26.37
	α Persei	W.	15.5	42.0	9.5	36.5	2.5	29.5	56.5	3 1 36.00		+ 0.18	2.06	3 13 38.94	38.46
	ξ Tauri		6.0	24.0	42.0	59.5	18.0	35.5	53.5	3 6 59.79		0.38	2.06	3 19 2.23	2.36
	ε Tauri			24 5	42.5	0.5	18.0	35.5	53.5	3 28 9.06	− 8.94	0.37	2.06	3 40 2.57	2.63
	λ Tauri		26.0	43.5	1.5	20.0	37.5	55.5	13.5	3 40 19.64		0.37	2.06	3 52 22.07	22.07
	α Tauri		21.5	39.5	57.5	16.5	34.5	52.5	11.5	4 15 16.21		0.35	2.06	4 27 18.62	18.47
	Moon, 2d L.		40.0	59.0	17.5	36.5	55.5	14.5	33.5	4 21 36.64		0.35	2.06	4 33 39.05	
	o¹ Orionis			23.5	42.0	0.0	18.0	36.0	54.5	4 39 9.00	− 9.05	0.36	2.06	4 44 2.37	2.36
	ι Tauri		8.5	27.5	46.5	5.0	23.5	42.5	1.5	4 42 5.00		0.32	2.06	4 54 7.38	7.20
6	γ Tauri	W.	48.8	7.2	25.6	43.6	1.6	19.6	38.0	4 10 43.49		0.00	+ 31.67	4 11 15.16	15.15
	α Tauri		52.0	10.8	28.8	46.8	5.2	23.6	41.6	4 26 46.97		0.00	31.64	4 27 18.61	18.50
	o¹ Orionis		36.4	54.8	13.6	31.2	48.8	7 2	25.2	4 43 31.03		0.00	31.61	4 44 2.64	2.39
	ι Tauri		38.8	58.0	16.8	35.6	54.4	13.6	32.0	4 53 35.60		0.00	31.58	4 54 7.18	7.29
	α Aurigæ		49.6	14.8	39.6	5.2	30.0	54.8	20.4	5 5 4.91		0.00	31.55	5 5 36.46	36.04
	ο Tauri		8.8	25.4	46.4	5.2	24.0	43.2	2.4	5 18 5.06		0.00	31.52	5 18 36.58	36.68
	δ Orionis		58.0	11.2	30.4	48.0	5.6	23.2	40.8	5 23 48.83		0.00	31.50	5 24 20.33	19.95
	ξ Tauri		10.8	30.8	49.6	8.4	26.8	46.0	4.8	5 28 8.17		0.00	31.48	5 28 39.65	37.97
	Moon, 2d L.		12.0	30.8	49.6	8.8	27.0	46.4	5.0	5 35 8.66		0.00	31.45	5 35 40.05	
	α Orionis						48.0	6.0	23.6	5 47 5.87	− 35.40	0.00	31.43	5 47 1.90	2.14
	η Geminorum		20.0	38.4	57.6	16.4	35.6	54.4	14.0	6 5 16.63		0.00	31.49	6 5 48.02	48.31
	μ Geminorum		23.2	42.4	1.2	20.4	39.2	58 4	17.6	6 13 20.34		0.00	31.37	6 13 51.71	51.63
7	α Aurigæ	W.					32.0	58.0	23 2	5 5 37.73	− 50.39	− 0.90	+ 29.74	5 5 36.18	36.08
	δ Orionis					50.0	8.0	25.6	43.2	5 24 16.70	− 26.34	+ 0.01	29.71	5 24 20.08	19.97
	ξ Tauri		12.8	33.2	52.0	10.8	30.4		7.6	5 28 4.47	+ 6.26	− 0.34	29.70	5 28 40.09	40.00
	α Orionis		39.6		14.2	32.8	50.4	8.0	26.9	5 46 38.50	− 5.91	0.11	29.68	5 47 2.16	2.17
	η Geminorum		21.6	40.4	0.4	19.6	38 0	56.8	16.4	6 5 19.03		0.36	29.66	6 5 48.33	48.34
	μ Geminorum		26.0	44.0	4.0	23.2	41.6	0.8	20.0	6 13 22.80		0.37	29.65	6 13 52.08	51.86
	Moon, 2d L.		44.4	4.0	23.2				39.2	6 37 27.70	+ 14.26	0.30	29.63	6 38 11.29	
	ξ Geminorum				23.2	42.0	0.8	19.6		6 54 51.40	− 9.39	0.33	29.61	6 35 11.29	11.67
23	α Aquilæ	W.	28.8	46.8	4.8	22.4	39.6	57.6	15.6	19 43 [illegible].23		− 4.34	+ 8.79	19 43 26.68	26.54
	β Aquilæ		56.8		32.0	49.6	7.2	25.2	42.0	19 47 55.47	− 5.90	− 3.08	8.79	19 47 55.98	55.38
	Moon, 1st L.					36.0	55.2	14.0	33.2	19 57 4.60	− 28.39	+ 9.76	8.79	[illegible] 54.76	
	α² Capricorni			40.4	9.2	26.0	43.6	2.8	20.8	20 9 35.60	− 9.02	+ 6.72	8.79	20 9 42.09	42.94
	α Cygni		24.8	42.2	14.8	36.8	3.2	28.0	53.2	20 36 38.86		− 28.85	8.79	20 36 18.80	16.80
	η Capricorni		24.4	52.2	19.0	31.2	49.6	8.0	27.2	20 55 30.80		+ 10.85	8.79	20 55 50.44	50.39
	51 Cygni		17.6	40.0	1.6	23.6	46.0	9.2	32.0	21 0 24.29		− 2.75	8.79	21 0 10.33	10.13
	ξ Cygni		40.0	0.0	20.4	40.4	0.8	20.4	[illegible].8	21 6 40.40		− 16.55	+ 8.79	21 6 32.64	32.77

Longitude of junction of the Gila and Colorado—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTIONS FOR— Imperfect transits.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	m. s.	m. s.	s.	h. m. s.	s.
Oct. 23	α Cephei	W.	54.4	31.6	8.8	46.0	23.2	8.0	38.0	21 15 47.14	.....	— 54.62	+ 8.79	21 15 1.31	0.63
	β Aquarii		33.2	51.2	9.2	26.8	44.0	1.6	20.0	21 23 26.57	.....	+ 3.18	8.79	21 23 38.54	38.69
	β Cephei		21.2	12.0	3.2	54.4	45.2	36.0	28.0	21 37 54.29	.....	—1 19.57	8.79	21 26 43.51	44.30
	ε Pegasi		51.6	8.8	26.8	44.4	2.0	19.6	.....	21 36 35.53	+ 8.91	— 4.70	8.79	21 36 48.53	48.51
	α Aquarii		2.0	19.6	37.2	54.8	12.0	29.6	47.2	21 57 54.63	.....	+ 0.54	8.79	21 58 3.96	3.96
	ζ Pegasi		.....	20.0	38.0	55.2	12.8	31.2	48.8	22 34 4.33	— 8.99	— 5.16	8.79	22 33 59.04	58.56
24	π Capricorni	W.	.....	17.2	35.6	54.0	12.0	30.8	49.6	20 19 3.90	— 9.27	+ 0.48	— 12.15	20 16 43.36	43.36
*	Moon, 1st L.		.....	50.0	8.8	27.6	46.0	5.2	24.0	20 48 36.93	— 9.34	0.42	12.15	20 48 15.86	.....
	η Capricorni		6.0	24.4	43.2	2.4	20.6	39.2	58.4	20 56 2.03	.....	0.53	12.15	20 55 50.41	50.41
	29 Capricorni		42.8	0.8	19.2	37.2	55.2	14.0	32.8	21 7 37.31	.....	0.40	12.15	21 7 25.56	25.94
	ι Capricorni		9.0	27.2	45.6	4.2	20.6	41.2	59.2	21 14 3.86	.....	0.44	12.15	21 13 52.15	52.06
	β Aquarii		.....	.....	.....	.....	8.0	25.6	43.6	21 24 25.73	— 35.39	0.15	12.15	21 23 38.41	38.60
	ε Pegasi		7.2	25.2	43.2	0.8	18.4	36.4	54.0	21 37 0.74	.....	— 0.23	12.15	21 36 48.36	48.49
	ζ Pegasi		17.6	35.2	53.2	10.8	28.8	46.4	4.8	22 34 10.97	.....	— 0.25	12.15	22 33 58.57	58.54
25	η Capricorni	E.	22.0	40.8	59.6	18.4	36.8	56.0	14.4	20 56 18.29	.....	.....	— 27.80	20 55 50.49	50.36
	61 Cygni		39.0	54.4	16.8	.....	0.8	23.2	40.8	21 0 38.00	— 0.01	0.00	27.80	21 0 10.19	10.09
	29 Capricorni		58.4	17.2	35.2	53.2	12.0	29.6	48.0	21 7 53.37	.....	0.00	27.80	21 7 25.57	25.23
†	ι Capricorni		24.8	45.2	1.6	20.0	38.4	57.2	15.6	21 14 20.11	.....	0.00	27.80	21 13 52.31	52.06
	β Aquarii		13.6	31.2	49.2	6.4	24.0	42.0	59.6	21 24 6.57	.....	0.00	27.80	21 24 38.77	38.58
	Moon, 1st L.		.....	16.8	35.2	53.6	19.2	31.2	49.2	21 40 3.03	— 9.93	0.00	27.80	21 39 25.30	.....
	ι Aquarii		59.0	10.4	28.8	46.8	4.4	23.2	41.2	21 58 46.69	.....	0.00	27.80	21 58 18.89	18.95
‡	σ Aquarii		15.2	32.8	50.0	8.8	26.8	44.6	2.4	22 23 8 66	.....	0.00	27.80	22 22 40.86	41.52
	ζ Pegasi		32.8	50.8	8.4	26.4	44.0	2.2	20.0	22 34 26.37	.....	0.00	27.80	22 33 58.57	58.53
	λ Aquarii		20.8	38.8	56.4	14.4	32 0	49.6	7.6	22 45 14.23	.....	0.00	27.80	22 44 46.43	46.62
	α Piscis Australis		46.8	7.2	28.0	48.0	8.8	28.4	48.8	22 49 48.00	.....	0.00	27.80	22 49 20.20	20.31
26	λ Ursæ Minoris	W.	.....	.....	.....	52.8	33.4	21.4	29.6	20 36 4.30	—22 17.45	+ 22.08	— 29.86	20 13 39.07	34.04
	29 Capricorni		0.4	18.4	36.8	55.2	13.2	31.2	50.0	21 7 56.03	.....	— 0.12	29.86	21 17 25.05	25.21
	ι Capricorni		26.8	.....	3.6	22.0	39.6	58.6	17.4	21 14 28.00	— 6.15	— 0.14	29.86	21 13 51.85	52.05
	β Cephei		.....	.....	22.4	13.6	4.0	55.6	46.8	21 28 4.48	51.15	+ 1.19	29.86	21 26 44.66	44.13
	γ Capricorni		20.0	38.2	57.2	15.4	33.2	52.0	10.8	21 32 15.26	.....	— 0.14	29.86	21 31 45.26	45.33
	δ Capricorni		19.2	37.6	55.6	14.8	32.8	50.8	9.6	21 39 14.34	.....	— 0.13	29 86	21 38 44.35	44.27
	ι Aquarii		54.4	12.8	30.8	48.8	6.8	25.2	43.6	21 58 48.91	.....	— 0.13	29.86	21 58 18.99	18.94
	σ Aquarii		18.0	35.6	53.6	12.0	29.6	47.2	5.6	22 23 11.66	.....	— 0.09	29.86	22 22 41.71	41.45
	Moon, 1st L.		16.2	34.0	52.8	12.4	28.8	47.2	5.6	22 31 10.77	.....	— 0.08	29.86	22 30 40.63	.....
	λ Aquarii		.....	41.2	58.8	16.8	34.4	52.0	10.0	22 45 25.53	— 8.88	— 0.06	29.86	22 44 46.73	46.61
	α Ursæ Maj., S. P.		58.4	36.8	15.4	53.8	30.8	9.2	47.2	22 54 59.94	.....	— 0.84	29.86	22 54 29.94	21.60
27	λ Ursæ Minoris	E.	.....	.....	.....	19.4	52.0	59.2	58.4	20 36 30.50	—22 18.00	— 7.41	— 33.82	20 13 31.27	39.80
	29 Capricorni		4.0	22.6	40.8	58.8	17.2	35.2	53.6	21 7 58.89	.....	+ 0.04	33.90	21 7 24.98	25.20
	ι Capricorni		30.4	49.2	7.6	26.0	44.4	2.8	21.2	21 14 25.94	.....	+ 0.04	33.97	21 14 59.01	52.03
	β Cephei		.....	.....	27.2	18.4	9.2	0.8	52.0	21 28 9.52	— 51.14	— 0.40	34.01	21 26 43.97	44.07
	ι Aquarii		58.8	16.8	34.8	52 8	10.8	28.8	46.8	21 58 52.80	.....	+ 0.04	34.09	21 58 18.75	18.92
	σ Aquarii		21.6	40.0	57.6	15.6	33.6	51.6	9.2	22 23 15.60	.....	+ 0.03	34.14	22 22 41.49	41.43
	λ Aquarii		27.2	42.2	3.2	20.8	38.4	56.0	14.0	22 45 20.69	.....	+ 0.02	34.19	22 44 46.59	46.60
	α Piscis Australis		53.6	14.0	34.4	54.8	15.2	35.6	55.6	22 49 54.74	.....	+ 0.06	34.20	22 49 20.69	20.98
	Moon, 1st L.		2.0	20.0	38.0	56.0	14.0	32.0	50.0	23 22 56.00	.....	+ 0.01	34.99	23 22 21.72	.....
	30 Piscium		55.6	12.8	30.4	47.6	5.6	23.2	40.8	23 40 48.00	.....	+ 0.01	34.34	23 40 13.67	13.52
	27 Piscium		40.8	58.0	16.4	33.6	51.2	8.8	26.4	23 51 33.60	.....	+ 0.01	34.37	23 50 59.94	59.44
	β Ceti		49.0	0.8	19.0	37.6	56.2	15.2	33.6	0 36 37.80	.....	+ 0.05	34.48	0 36 3.37	3.94
	Polaris		44.4	9.2	31.2	50.8	.....	.....	.....	0 49 46.40	+16 55.09	— 5.83	34.53	0 5 61.04	59.55
28	29 Capricorni	E.	6.8	24.8	42.8	0.8	18.8	37.6	56.0	21 8 1.00	.....	— 0.08	— 36.08	21 7 24.93	25.19
	β Aquarii		22.0	39.6	57.2	14.8	32.4	50.0	8.0	21 24 14.86	.....	— 0.03	36.14	21 23 38.68	38.54
	β Cephei		.....	35.4	52.8	20.4	10.8	2.0	53.6	21 27 45.47	— 23.56	+ 0.81	36.15	21 26 44.57	44.01
	δ Capricorni		15.6	44.0	2.2	20.4	38.8	57.2	15.6	21 39 20.54	.....	— 0.09	36.19	21 38 44.96	44.94
	σ Aquarii		24.4	42.4	0.0	18.0	36.0	54.0	12.0	22 23 18.11	.....	— 0.06	36.37	22 22 41.68	41.42
	λ Aquarii		.....	47.6	7.4	23.2	40.4	58.4	16.4	22 45 39.23	— 8.88	— 0.04	36.44	22 44 46.67	46.59
	α Ursæ Minoris		4.4	42.8	21.2	58.8	36.0	15.2	52.4	22 54 58.69	.....	— 0.57	36.48	22 54 21.64	21.66
	γ Cephei		4.8	21.2	38.0	.....	.....	28.4	.....	23 32 38.10	+1 16.95	+ 1.96	— 36.61	23 33 19.70	19 36

* Wire IV recorded 23.6*s*. † Wire IV recorded 51.2*s*. ‡ Wire VI recorded 40.6*s*.

Longitude of junction of the Gila and Colorado—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTIONS FOR— Imperfect transits.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	m. s.	s.	s.	h. m. s.	s.
Oct. 26	20 Piscium	E.	57.2	14.8	32.8	50.0	7.2	25.0	43.2	23 40 50.00	.....	— 0.02	— 36.64	23 40 13.37	13.51
	27 Piscium		43.2	0.8	18.4	36.0	53.6	11.6	29.2	23 51 36.11	.....	— 0.02	36.68	23 50 59.41	59.42
	Moon, 1st L.		42.8	1.2	20.0	38.0	56.0	14.0	30.2	0 15 37.71	.....	— 0.01	36.76	0 15 0.94	...
	β Ceti		44.4	2.8	21.6	40.4	58.8	17.2	36.0	0 36 40.17	.....	— 0.10	36.84	0 36 3.23	3.24
	20 Ceti		4.8	22.0	40.6	57.2	14 8	32.0	50.0	0 45 57.37	.....	— 0.01	36.87	0 45 20.49	20.56
	Polaris		31.6	51.2	11.2	.....	.....	.....	.....	0 43 51.33	+22 33.44	+ 11.41	36.94	1 5 59.24	59.38
	θ¹ Ceti		15.2	32.8	50.8	8.4	26.4	44.0	2.0	1 17 8.51	.....	— 0.05	36.98	1 16 31.48	31.57
29	α Capricorni	W.	3.2	20.3	39.2	56.8	15.9	29.6	.....	20 9 47.50	+ 9.02	+ 0.14	— 36.74	20 9 17.92	18.26
	α² Capricorni		27.2	45.8	3.4	21.2	39 3	. ....	.....	20 18 3.38	+ 18.04	+ 0.14	36.75	20 9 49.81	49.13
	π Capricorni		26.0	44 4	2.8	21.2	40.0	58.0	17.2	20 19 21.37	.....	+ 0.21	36.77	20 18 42.61	42.98
	α Cephei		48.8	26.0	3.2	40.8	17.6	55.6	33.2	21 15 40.74	.....	— 1.14	36.87	21 15 0.73	0.38
	β Aquarii		24.8	42.8	.....	18.0	35.6	53.2	10.8	21 24 20.87	— 2.93	+ 0.07	36.88	21 23 39.13	38.52
	β Cephei		.....	.....	33.6	25.0	15.2	6.4	58.0	21 28 15.68	— 51.14	— 1.66	36.89	21 26 43.99	43.95
	ε Pegasi		34.4	52.4	10.0	27.6	45.6	3.4	21.6	21 37 27.89	.....	— 0.09	36.90	21 36 48.90	48.41
	ι Aquarii		4.0	22.8	40.4	58.4	16.4	34.8	52.8	21 58 58.51	.....	+ 0.16	36.94	21 58 19.73	18.68
	σ Aquarii		24.0	43.6	2.4	20.0	37.6	55.6	13.6	22 23 19.54	.....	+ 0.12	36.98	22 22 40.68	41.46
	ξ Pegasi		43.2	1.6	19.6	37.2	54.8	13.2	30.8	22 34 37.20	.....	— 0.10	39.00	22 33 58.10	58.48
	λ Aquarii		31.6	49.2	7.6	25.2	42.8	0.4	.....	22 45 16.13	+ 8.86	+ 0.08	39.02	22 44 46.07	46.57
	α Urse Minoris		3.2	21.2	19.2	58.0	35.6	13.6	52.0	22 54 57.54	.....	+ 1.12	39.03	22 54 19.63	21.71
	β Ceti		46.0	4.8	23.2	41.6	0.4	18.8	37.6	0 36 41.77	.....	+ 0.20	39.20	0 36 2.77	3.24
	δ Piscium		40.0	57.6	16.0	33.2	50.8	8.8	26.4	0 41 33.96	.....	— 0.08	39.91	0 40 53.97	54.21
	Moon, 1st L.		59.8	17.6	35.6	53.6	11.6	29.6	47.6	1 9 53.63	.....	— 0.04	39.95	1 9 14.34	.....
	θ¹ Ceti		17.2	34.8	52.8	10.8	28.0	46.0	4.0	1 17 10.51	.....	+ 0.09	39.97	1 16 31.33	31.57
	μ Piscium		5.6	23.6	41.6	58.8	16.8	34.0	52.0	1 22 58.91	.....	— 0.06	39.98	1 22 19.57	19.71
	ν Piscium		24.0	42.0	59.6	17.2	34.2	52.0	10.0	1 34 17.00	.....	— 0.06	39.30	1 33 37.64	37.80
	ε Piscium		14.8	32.8	50.4	8.4	26.4	43.6	1 8	1 38 8.29	.....	— 0.08	39.39	1 37 28.91	28.77
30	ι Piscium	W.	.....	.....	.....	.....	11.2	30.8	48.4	23 33 30.13	— 35.94	— 0.12	— 41.56	23 32 13.21	13.94
	20 Piscium		2.0	20.0	37.2	54.8	12.8	30.4	48.0	23 40 55.03	.....	+ 0.09	41.58	23 40 13.54	13.49
	27 Piscium		48.0	5.6	23.2	40.8	58.4	16.0	34.0	23 51 40.86	.....	+ 0.11	41.67	23 50 59 36	59.41
	α Andromedæ		21.6	41.2	1.6	21.2	40.8	0.8	20.8	0 1 21.14	.....	— 0 77	41.63	0 0 38.74	38.78
	γ Pegasi		18.8	36.8	54.8	12.8	30.8	48.8	7.6	0 6 12.91	.....	— 0.37	41.63	0 5 30.91	30.97
	α Cassiopeæ		13.6	44.0	15.6	46.8	17.2	48.8	20.8	0 29 46.69	.....	— 2.10	41.69	0 29 2.90	3.00
	β Ceti		49.2	7.2	26.0	44.4	2.8	21.2	40 4	0 36 44.46	.....	+ 0.39	41.70	0 36 3.15	3.23
	δ Piscium		42 8	0.8	18.4	36.0	53.6	11.6	29.2	0 41 36.06	.....	— 0.17	41.71	0 40 54.18	54.20
	30 Ceti		9.6	27.2	44.4	2.0	19.6	37.6	54.8	0 46 9.17	.....	+ 0.05	41.72	0 45 20.50	20.55
	α Arietis		29.2	48.4	7.2	26.4	45.2	4.4	23.6	1 59 26.34	.....	— 0.60	41.88	1 58 43.86	43.88
	Moon, 1st L.		25 2	43.6	1.6	19.6	38.0	56.0	14.4	2 6 19.77	.....	— 0 21	41.89	2 5 37.67	.....
	ξ Ceti		0.4	18.4	36.4	53.6	11.2	29.2	47.2	2 20 53.77	.....	— 0.20	41.92	2 20 11.65	11.47
	α Ceti		15.6	33.2	51.2	8.8	26.0	44.0	1.6	2 55 8.63	.....	— 0.09	41.99	2 54 26.55	26.72
	δ Arietis		50.4	9.2	26.0	46.8	6.8	23.6	42.0	3 3 46.69	.....	— 0.50	42.01	3 3 4.18	3.76
	α Persei		2.0	29.2	55.6	22.8	49.6	16.8	44.0	3 14 29.86	.....	— 1.67	42.04	3 13 39.15	39.05
	ξ Tauri		51.6	9.6	27.2	44.8	2.4	20.4	38.4	3 19 44.91	.....	— 0.23	42.05	3 19 2.63	2.78
31	δ Capricorni	E.	34.0	52.0	10.0	.....	.....	.....	.....	21 38 52.00	+ 36.68	+ 0.37	— 45.01	21 38 44.04	41.07
	λ Aquarii		38.0	56.0	14.0	31.2	49.2	6.8	24.8	22 45 31.43	.....	+ 0.18	45.03	22 44 46.49	46.47
	α Piscis Australis		3.6	24.0	44.0	4.4	24.8	45.6	6.0	22 50 4.63	.....	+ 0.73	45.04	22 49 20.22	20.23
	α Pegasi		8.0	26.0	44.0	2.0	20.0	38.0	56.0	22 58 2.00	.....	— 0.32	45.17	22 57 16.51	17.22
	ι Piscium		6.4	23.6	41.2	59.2	17.2	34.8	52.0	23 32 59.20	.....	— 0.10	45.24	23 32 13.86	13.93
	20 Piscium		5.6	23.6	40.8	58.0	16.0	33.6	51.2	23 40 58.40	.....	+ 0.08	45.26	23 40 13.22	13.36
	27 Piscium		51.6	9.6	27.6	44.0	2.4	20.0	37.6	23 51 44.74	.....	+ 0.09	45.29	23 50 59 54	59.30
	α Andromedæ		24.4	44.8	4.8	.....	44.8	4.8	24.8	0 1 24.73	— 0.01	— 0.67	45.31	0 0 38.74	38.78
	γ Pegasi		22.8	40.8	58.8	16.8	34.8	52.8	10.8	0 6 16.80	.....	— 0.39	45.33	0 5 31.15	30.96
	Polaris		36.0	0.0	19.6	29.6	40.6	4.4	29.6	1 7 31.40	.....	— 47.62	45.43	1 5 58.35	58.74
	ν Piscium		30.0	48.0	6.0	.....	.....	.....	.....	1 33 48.00	+ 35.94	— 0.10	45.49	1 33 37.65	37.78
	α Arietis		32.4	51.2	10.8	29.6	48.8	.....	26.8	1 59 23.27	+ 6.36	— 0 59	45.53	1 58 43.58	43.88
	ξ¹ Ceti		56.0	14.0	31.2	48.8	6.8	24.8	42.0	2 5 49.09	.....	— 0.18	45.55	2 5 3.36	3.36
	ξ¹ Ceti		3.6	22.0	39.2	56.8	14.4	32.8	50.0	2 20 56.97	.....	— 0.17	45.59	2 20 11.21	11.48
	α Ceti		20.0	.....	.....	.....	29.6	47.6	.....	2 55 19.40	+ 0.13	— 0.07	45.63	2 54 26.83	26.72
	Moon, 2d L.		45.6	4.0	22.0	40.4	.....	.....	.....	3 7 13.00	+ 27.64	— 0.27	— 45.67	3 6 54.70	.....

Longitude of junction of the Gila and Colorado—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIME OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTIONS FOR— Imperfect transits.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	m. s.	s.	s.	h. m. s.	s.
Nov. 1	Polaris	W.	.....	41.6	0.8	17.0	29.2	43.4	13.2	1 12 55.03	— 38.97	— 30.80	— 46.76	1 5 56.50	58.51
	μ Piscium		13.6	31.2	49.2	6.8	24.0	41.6	59.6	1 32 6.57	.....	0.07	46.79	1 22 19.79	19.67
	ν Piscium		32.0	49.6	7.2	24.4	42.0	59.6	17.6	1 34 24.63	.....	0.07	46.79	1 33 37.77	37.77
	α Arietis		34.0	53.6	12.0	31.6	50.0	9.2	28.0	1 59 31.20	.....	0.34	46.82	1 58 44.04	43.80
	ξ^1Ceti		57.2	15.2	32.4	50.4	8.0	25.6	43.6	2 5 50.34	.....	0.11	46.84	2 5 3.39	3.37
	ξ^2Ceti		5.6	22.8	40.8	58.4	16.0	33.6	51.6	2 20 58.40	.....	0.11	46.86	2 20 11.43	11.49
	χ Ceti		26.4	43.6	1.6	18.8	36.8	54.0	12.0	2 36 19.03	.....	0.04	46.88	2 35 32.11	32 07
	α Ceti		20.8	38.4	56.0	14.0	30.8	48.8	6.4	2 55 13.60	.....	0.05	46.90	2 54 26.65	26.74
	δ Arietis		55.6	13.6	32.6	51.2	9.6	26.0	47.2	3 3 51.03	.....	0.28	46.91	3 3 3.84	3.80
	α Polaris		6.4	32.8	0.4	27.2	54.0	20.8	47.6	3 14 27.03	.....	0.09	46.92	3 13 39.18	39.09
	ξ Tauri		56.0	14.0	32.0	50.0	7.2	25.2	43.2	3 19 49.66	.....	0.13	46.93	3 19 2.60	2.80
	ϵ Tauri		56.4	14.4	32.4	50.4	8.0	26.0	44.0	3 40 50.23	.....	0.15	46.96	3 40 3.12	3.11
	λ Tauri		16.0	34.0	52.0	10.0	28.0	46.0	4.0	3 53 10.00	.....	0.17	46 98	3 52 22.85	22.55
	Moon, 2d L.		23.2	42.4	1.2	19.6	38.0	57.2	16.0	4 9 19.66	.....	0.23	46.99	4 8 32.44	.....
	γ Tauri		8.8	26.8	44.8	2.8	20.8	38.8	56.8	4 12 2.80	.....	0 22	47.00	4 11 15.58	15.75
	α Tauri		11.6	29.6	48.0	6.8	24.4	42.8	0.8	4 28 6.29	.....	0.23	47.02	4 27 19.04	19.09
	o^1Orionis		55.6	14.0	32.0	50.0	8.0	26.0	44.0	4 44 49.96	.....	0.20	47.04	4 44 2.70	2.97
	ι Tauri		59.2	17.6	36.4	55.6	14.0	32.8	52.0	4 54 55.37	.....	0.31	47.05	4 54 8.01	7.80
2	α Tauri	E.	.....	.....	.....	8 8	27.6	45.6	4.0	4 28 36.50	— 27.42	+ 0.06	— 49.99	4 27 19.15	19.10
	o^1Orionis		58.4	16.4	34.8	53.4	10.8	28.8	46.8	4 44 52.63	.....	0 05	50.01	4 44 2.67	3.02
	ι Tauri		0.8	19.6	38.8	57.6	16.8	35.6	54.4	4 54 57.66	.....	0.08	50.02	4 54 7.79	7.99
	Moon, 2d L.		4.4	23.6	42.4	1.6	20.8	39.2	58.4	5 13 1.49	.....	0.06	50.05	5 12 11.50	.....
	β Tauri		38.8	58.8	18.8	38.8	58.8	18.8	38.8	5 17 38.80	.....	0.01	50.06	5 16 48.85	48.61
	δ Orionis		18.0	36.0	52.8	10.8	28.4	45.6	3.6	5 25 10.74	.....	0.00	50.07	5 24 20.67	20.62
*	ξ Tauri		34.0	53.0	12.0	30.4	49.6	8.8	27.2	5 29 30.71	.....	0.08	50.08	5 28 40.71	40.70
†	α Orionis		59.6	17.6	35.6	53.8	10.8	28.4	46.0	5 47 53.11	.....	0.02	50.10	5 47 3.03	2.86
	η Geminorum		41.6	0.8	20.0	39.2	58.0	17.2	36.0	6 6 38.97	.....	0.08	50.12	6 5 48.93	48.90
	51 (Hev.) Cephei		58.0	11.6	30.4	22.4	29.2	36.4	42.4	6 29 22.91	.....	+ 4.15	50.15	6 28 36.91	36.92
3	ϵ Tauri	W.	1.2	19.2	37.2	55.2	12.8	30.8	48.8	3 40 55.03	.....	0.00	— 52.07	3 40 2.96	3.13
	γ^1Eridani		0.0	18.0	36.0	54.0	12.0	30.4	48.4	3 51 54.11	.....	0.00	52.09	3 51 2.02	2.10
	γ Tauri		13.2	31.6	49.6	7.6	26.0	44.4	2.4	4 12 7.83	.....	0.00	52.11	4 11 15.72	15.77
	α Tauri		16.8	34.8	52.8	11.2	29.6	47.6	6.8	4 28 11.37	.....	0.00	52.13	4 27 19.24	19.12
	o^1Orionis		1.2	19.2	37.2	55.2	13.2	31.2	49.2	4 44 55.20	.....	0 00	52.15	4 44 3.05	3.03
	α Aurigæ		13.6	38.8	4.0	29.2	53.6	19.2	44.8	5 6 29.03	.....	0.00	52.17	5 5 36.86	37.01
	ϵ Tauri		32.8	51.6	10.8	29.6	48.4	7.6	26.8	5 19 29.66	.....	0.00	52.19	5 18 37.47	37.44
	δ Orionis		20.4	37.6	55.2	13.2	30.0	48.0	5 6	5 25 12.86	.....	0.00	52.20	5 24 20.66	20.64
	ξ Tauri		36.8	55.6	14.4	32.8	51.6	10.4	29.2	5 29 32.97	.....	0.00	52.21	5 28 40.76	40.72
	α Orionis		2.0	20.0	37.6	55.2	12 8	34.4	48.4	5 47 55.20	.....	0.00	52.23	5 47 2.97	2.88
	η Geminorum		44.0	3.2	22.0	41.2	0.0	19.2	38.4	6 6 41.14	.....	0.00	52.25	6 5 48.89	48.92
	μ Geminorum		47.6	6.8	26.4	44.8	.....	.....	.....	6 14 16.40	+ 28.52	0.00	52.27	6 13 52.65	52.67
	Moon, 2d L.		37.2	56.4	15.6	34.8	53.2	12.8	32.0	6 17 34.57	.....	0.00	52.28	6 16 42.29	.....
	γ Geminorum		59.6	18.0	36.0	54.8	12.8	30.8	49.6	6 29 54.51	.....	0.00	52.29	6 29 2.22	2.25
	α Canis Majoris		22.0	42.0	6.0	24.8	42.8	1.2	20.0	6 39 24.63	.....	0.00	52.31	6 38 32.32	32.15
4	γ Tauri	E.	15 2	33.2	51.6	9.6	27.6	46.0	4.4	4 12 9.66	.....	0 00	— 54.11	4 11 15.55	15.79
	α Tauri		18.0	36.4	54.8	13.2	31.6	50.0	8.0	4 28 13.14	.....	0.00	54.13	4 27 19.01	19.14
‡	o^1Orionis		2.8	20.8	38.8	56.8	15.6	33.2	51.6	4 44 57.00	.....	0.00	54.15	4 44 2.94	3.05
	ι Tauri		5.6	24.0	43.2	2.0	20.8	40.0	58.4	4 55 2.00	.....	0.00	54.18	4 54 7.82	7.96
	α Aurigæ		15.4	40.8	6.4	31.2	56.4	21.2	46.8	5 6 31.17	.....	0.00	54.20	5 5 36.97	37.04
	β Tauri		42.8	2.8	22.8	42.8	2.8	22.8	42.8	5 17 42.80	.....	0.00	54.22	5 16 48.58	48 66
	δ Orionis		22.4	40.0	57.6	14.8	32.0	50.0	7.6	5 25 14.91	.....	0.00	54.22	5 24 20.69	20.66
	α Leporis		.....	.....	43.2	1.2	20.2	38.0	56.8	5 37 19.88	— 18.47	0.00	54.25	5 36 7.16	7.05
	α Orionis		3.6	21.6	39.6	57.6	14.8	32.8	50.4	5 47 57.90	.....	0.00	54 27	5 47 2.93	2.90
	η Geminorum		46.4	5.4	24.4	43.8	2.4	21.2	40.0	6 6 43.34	.....	0.00	54.28	6 5 49.06	48.95
	μ Geminorum		49.6	8.8	28.0	47.2	6.0	25.2	44 0	6 14 46.97	.....	0.00	54.30	6 13 52.67	52.70
	δ Ursæ Min., S. P.		.....	.....	.....	33.6	28.8	.....	22.8	6 28 5.07	—6 35.73	0.00	54.31	6 20 35.03	37.30
	51 (Hev.) Cephei		.....	.....	24.8	.....	38.0	43.6	.....	6 33 35.47	4 4.67	0.00	54.31	6 28 36.49	37.66
	γ Geminorum		.....	20.0	38.8	56.4	14.8	33.2	52.0	6 39 5.87	9.18	0.00	— 54.32	6 29 2.37	2.28

* Wire II recorded 52.0s. † Wire IV recorded 54.8s. ‡ Wire II recorded 18.8s.

Longitude of junction of the Gila and Colorado—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTIONS FOR— Imperfect ransits.	Instru- ment.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	m. s.	s.	m. s.	h. m. s.	s.
Nov. 4	α Canis Majoris...	E.	32.0	50.0	8.4	26.8	46.8	3.6	21.6	6 39 26.74	.....	0.00	— 54.33	6 38 32.41	32.18
	ε Canis Majoris...		38.4	58.4	18.4	38.4	58.4	.....	.....	6 53 18.40	+ 20.05	0.00	54.34	6 52 44.11	43.85
	ζ Geminorum...		10.0	28.8	47.6	6.0	24.8	44.0	2.8	6 56 6.29	.....	0.00	54.34	6 55 11.93	11.99
	λ Geminorum....		26.8	45.2	4.0	22.0	40.0	58.8	16.5	7 10 21.90	.....	0.00	54.35	7 9 27.55	27.53
	δ Geminorum....		.....	.....	.....	3.2	22.4	41.2	0.0	7 12 31.70	— 28.45	0.00	54.35	7 11 8.90	8.93
	Moon, 2d L.....		32.4	51.6	10.4	29.6	48.8	7.6	28.8	7 21 29.60	.....	0 00	54.36	7 20 35.24	.....
	68 Geminorum....		1.2	19.2	38.0	56.0	14.4	32.8	50.8	7 25 56.06	.....	0.00	54.37	7 25 1.69	1.98
	α Canis Majoris...		26.8	45.2	2.8	20.4	38.4	56.0	14.0	7 32 20.51	.....	0.00	54.38	7 31 26 13	26.06
	β Geminorum....		1.2	21.2	41.6	1.2	21.2	41.2	1.2	7 37 1.26	.....	0.00	54.39	7 36 6.87	6.87
5	μ Geminorum....	W.	50.4	9.6	28.8	48.0	7.2	26.0	45.2	6 14 47.86	.....	+ 0.17	— 55.17	6 13 52.86	52.73
	δ Ursæ Min., S. P.		.....	.....	.....	37.6	35.2	.....	26.4	6 28 13.07	—6 34.77	— 6.92	55.18	6 20 36.10	36.05
	51 (Hev.) Cephei..		.....	.....	.....	.....	30.8	35.2	43.2	6 41 36.46	12 12.23	+ 8.55	55.18	6 28 37.54	38.28
	γ Geminorum....		2.0	20.4	38.8	57.2	15.6	34.0	52.4	6 29 57.90	.....	0.12	55.18	6 29 2.14	2.39
	α Canis Majoris...		.....	.....	9.2	27.6	45.6	3.6	22.4	6 39 45.68	— 18.33	— 0.12	55.90	6 38 32.03	32.21
	ε Canis Majoris...		.....	.....	19.6	39.2	59.2	19.2	39.6	6 53 59.36	20.05	0.23	55.22	6 52 43.86	43.68
	λ Geminorum....		27.6	46.0	4.0	22.8	40.8	59.2	17.6	7 10 29.55	.....	+ 0.12	55.25	7 9 27.42	27.55
	68 Geminorum....		2.0	20.0	38.4	56.8	14.8	33.6	52.0	7 25 56.80	.....	0.12	55.27	7 25 1.65	2.00
	α Canis Minoris...		28.8	44.8	3.6	21.6	39.2	56.8	15.2	7 32 21.43	.....	0.04	55.28	7 31 26.19	26.09
	β Geminorum....		2.4	22.0	42.4	2.0	22.0	42.0	2.0	7 37 2.14	.....	0.22	55.28	7 36 7.05	6.90
	15 Argus		6 8	26.0	45.6	4.4	23.2	42.8	2.4	8 2 4.46	.....	— 0.18	55.31	8 1 8.97	8.99
	ζ Cancri.....		35.2	53.6	12.0	30.4	49.2	7.6	26.0	8 4 30.57	.....	+ 0.13	55.31	8 3 35.39	35.13
	Moon, 2d L.....		28.0	47.2	6.0	25.2	43.6	2.4	21.2	8 23 24.80	.....	0.12	55.33	8 22 29.59	.....
	δ Cancri.....		7.6	26.0	44.0	3.6	21.6	40.4	59.2	8 37 3.90	.....	0.13	55.36	8 36 7.97	8.03
	ε Hydræ.....		50.8	8.8	26.4	44.0	1.6	19 2	37.2	8 39 44.00	.....	0.05	55.36	8 38 48.69	48.73
	α Cancri.....		16.8	34.8	52.8	10.8	28.8	46.8	4.8	8 51 10.80	.....	0.09	55.38	8 50 15.15	15.43
6	α Canis Majoris...	E.	34.0	53.6	11.6	29.6	48.0	6.4	24.8	6 39 29.71	.....	0.00	— 57.31	6 38 32.40	32.23
	ε Canis Majoris...		41.2	1.2	21.2	41.2	1.2	21.2	41.2	6 53 41.20	.....	0.00	57.33	6 52 43.87	43.81
	ζ Geminorum....		.....	.....	50.4	9.2	28.0	47.2	5.6	6 56 28.08	— 18.80	0.00	57.33	6 55 11.95	12.05
	λ Geminorum....		30.0	48.0	6.0	24.4	43.6	1.6	20.0	7 10 24.80	.....	0.00	57.37	7 9 27.43	27.57
	β Canis Minoris...		4.0	22.0	40.0	57.6	16.0	33.6	51.2	7 19 57.77	.....	0.00	57.38	7 19 0.39	0.33
	68 Geminorum....		4.0	22.8	41.2	59.2	17.6	36.0	54.0	7 25 59.26	....	0.00	57.39	7 25 1.87	2.09
	α Canis Minoris...		30.8	48.4	6.0	23.6	41.6	59.2	16.8	7 32 23.77	.....	0.00	57.39	7 31 26.38	26.12
	β Geminorum....		4.4	24.4	44.4	4.4	24.4	44.4	4.4	7 37 4.40	.....	0.00	57.39	7 36 7.01	6.94
	15 Argus		.....	.....	47.2	6.4	26.0	45.2	4.8	8 2 25.93	— 19.22	0.00	57.42	8 1 9.98	9.92
	β Cancri.....		26.0	44.0	1.6	18.8	.....	54.8	12.8	8 9 16.33	+ 2.94	0.00	57.43	8 [illegible] 21.84	21.84
	θ Cancri.....		.....	21.2	40.0	58.4	16.8	35.6	54.0	8 24 7.66	— 9.28	0.00	57.45	8 23 0.93	1.19
	δ Cancri.....		10.0	28.0	47.2	5.6	24.0	42.4	1.2	8 37 5.49	.....	0.00	57.47	8 36 8.02	8.18
	ε Hydræ.....		.....	10.8	28.8	46.0	3.6	22.0	39.6	8 39 55 13	— 8.86	0.00	57.47	8 38 48.80	48.76
	α Cancri.....		19.2	37.2	55.2	12.8	31.2	49.2	7.2	8 51 13.14	.....	0.00	57.49	8 50 15.65	15.55
	ξ Cancri.....		42.4	1.6	20.8	.....	58.4	18.0	37.2	9 1 39.73	— 0.01	0.00	57.50	9 0 42.22	42.39
	Moon, 2d L.....		38.4	57.2	15.6	34.0	52.8	11.2	29.6	9 22 34.11	.....	0.00	57.53	9 21 36.58	.....
*20	Moon, 1st L....	E.	5.5	24.5	43.0	1.8	20.5	39.5	58.5	20 16 1.90	.....	+ 0.24	+ 19 22.04	20 38 24.18	.....
	ζ Cygni.....		9.5	30.0	50.0	10.0	30.8	50.5	11.0	20 54 10.21	.....	— 0.44	19 22.04	21 6 31.81	32.24
	ε Capricorni.....		34.5	52.5	11.0	29.5	47.5	6.3	24.5	21 1 29.40	.....	+ 0.24	19 22.04	21 13 51.68	51.65
	α Cephei.....		.....	.....	.....	.....	15.5	54.0	30.8	21 3 53.43	—1 14.70	— 1.45	19 22.04	21 14 59.32	59.43
	β Aquarii....		23.0	40.5	58.5	16.2	33.5	51.5	9.8	21 11 16.14	.....	+ 0.08	19 22.04	21 23 38.26	38.20
	β Cephei.....		.....	.....	32.0	32.8	13.8	5.0	56.0	21 15 13.92	— 51.14	— 2.11	19 22.04	21 27 42.71	43.60
	ε Pegasi.....		33.5	50.5	8.5	25.0	44.0	1.5	19.5	21 24 26.07	.....	0.12	19 22.04	21 26 47.99	48.09
†22	Moon, 1st L....	E.	34.4	52.8	11.2	29.2	47.6	6.4	24.4	22 10 29.43	.....	0.00	— 1 29.88	22 8 59.55	.....
	σ Aquarii.....		17.2	35.4	52.8	10.8	28.8	46.8	4.8	22 24 10.21	....	0.00	1 29.88	22 23 41.03	40.98
	ξ Pegasi.....		34.4	52.4	10.4	.....	45.6	3.6	21.6	22 35 28.00	— 0.01	0.00	1 29.88	22 33 58.11	58.15
‡23	α Aquarii.....	E.	42.8	0.8	18.4	35.8	52.8	10.8	28.8	21 59 35.71	.....	0.00	— 1 30.22	21 58 3.49	3.53
	θ Aquarii.....		32.4	50.4	8.4	26.4	44.4	2.4	20.8	23 10 26.46	.....	0.00	1 30.24	22 8 54.22	53.58
	σ Aquarii.....		19.6	37.6	55.6	13.6	30.8	48.8	7.2	23 24 13.31	.....	0.00	1 30.26	22 22 41.05	40.97
	ξ Pegasi.....		37.2	54.8	12.4	30.4	48.4	6.0	24.0	23 35 39.46	.....	0.00	1 30.28	22 33 58.18	58.14
	λ Aquarii.....		25.2	43.2	1.2	18.8	36.0	54 0	12.0	23 46 18.53	....	0.00	1 30.29	22 44 48.24	46.25
	α Piscis Australis..		50.8	11.2	32.0	52.4	12.4	32.4	53.2	23 50 52.06	.....	0.00	— 1 30.30	22 49 19.76	19.87

* Chronometer 2475. † Chronometer 719. ‡ Wire IV recorded 34.6s. All these wires increased [illegible].

Longitude of junction of the Gila and Colorado—Continued.

DATE.	OBJECT.	LAMP.	CHRONOMETER TIMES OF TRANSIT. I.	II.	III.	IV.	V.	VI.	VII.	MEAN OF OBS'D WIRES	CORRECTIONS FOR— Imperfect transits.	Instrument.	Chronometer.	OBSERVED A.R.	TABULAR A.R.
1849.			s.	s.	s.	s.	s.	s.	s.	h. m. s.	s.	s.	m. s.	h. m. s.	s.
Nov. 23	Moon 1st L.....	E.	46.0	4.0	22.0	40.0	58.4	16.4	34.4	23 0 40.17	.....	0.00	— 1 32.30	22 59 7.87	.....
	ϕ Aquarii.....		11.2	29.2	46.2	4.4	22.0	40.0	58.0	23 8 4.43	.....	0.00	1 32.31	23 6 32.12	32.27
	χ Aquarii.....		47.2	4.8	22.8	40.8	58.8	16.4	34.4	23 19 40.74	.....	0.00	1 32.32	23 11 8.42	3.34
24	σ Aquarii.....	E.	22.0	40.0	58.0	16.0	34.0	52.0	10.0	22 24 16.00	.....	+ 0.14	— 1 35.09	22 22 41.05	40.95
	ξ Pegasi.....		39.2	57.6	15.6	33.2	52.8	8.8	26.8	22 35 33.43	.....	— 0.12	1 35.11	22 33 58.20	58.13
	λ Aquarii.....		27.6	46.0	3.6	21.2	38.4	56.8	14.4	22 46 21.14	.....	+ 0.10	1 35.12	22 44 46.12	46.94
	α Piscis Australis.		53.6	14.0	34.0	54.4	14.8	35.6	55.6	22 50 54.57	.....	0.39	1 35.12	22 49 19.84	19.86
	ϕ Aquarii.....		14.0	32.0	49.6	7.2	24.8	42.4	0.4	23 8 7.90	.....	0.08	1 35.15	23 6 32.13	32.25
	χ Aquarii.....		50.0	8.0	26.0	43.6	1.2	19.6	37.2	23 19 43.66	.....	0.12	1 35.15	23 19 8.63	8.33
	20 Piscium.....		55.2	13 2	30.8	48.4	6.0	23.6	40.8	23 41 28.99	.....	0.04	1 35.18	23 40 13.15	13.94
	Moon, 1st L ...		34.0	52.0	10.0	28.0	46.0	4.0	22.0	23 51 28.00	.....	0.09	1 35.91	23 49 52 88	.....
	33 Piscium.....		20.8	38 8	56.4	14.0	31.6	49.2	6.8	23 59 13.94	.....	0.08	1 35.29	23 57 38.80	38.75
	γ Pegasi.....		11.6	30.0	48.0	6.0	24.0	42.0	0.8	0 7 6.06	.....	— 0.17	1 35.23	0 5 30.66	30.76
25	30 Piscium.....	W.	57.6	15.6	32.2	50.8	8.0	.....	43.2	23 41 44.73	+ 5.88	0.00	— 1 37.39	23 40 13.23	13.22
	27 Piscium.....		42.8	0.4	18.4	35.6	53.6	12.4	28.8	23 59 36.00	.....	0.00	1 37.38	23 50 58.62	59.06
	33 Piscium.....		22.8	40.8	58.4	16.4	34.0	51.6	9.6	23 59 16.23	.....	0.00	1 37.38	23 57 38.85	38.74
	α Andromedæ		.....	36.0	58.0	16.4	36.0	56.0	16.0	0 2 26.13	— 9.97	0.00	1 37.39	0 0 38.77	38.52
	γ Pegasi.....		14.0	32.0	50.0	8.0	26.0	44.0	2.0	0 7 8.00	.....	0.00	1 37.39	0 5 30.61	30.75
	δ Piscium.....		38.4	56.0	14.0	31.6	.....	.....	.....	0 42 5.00	+ 26.59	0.00	1 37.44	0 40 54.06	53.96
	Moon, 1st L		.....	58.8	16.8	34.8	52.8	10.4	28.4	0 43 43.67	— 8.98	0.00	1 37.44	0 41 57.27	.....
	20 Ceti.....		.....	22.4	40.0	58.0	15.6	32.8	50.8	0 47 6.60	8.79	0.00	1 37.44	0 45 20.37	20.26
27	Moon, 1st L....	E.	57.0	15.5	33.5	52.0	10.0	28.5	47.0	2 20 51.93	.....	+ 0.68	+ 12 25.83	2 33 17.08	.....
	μ Ceti.....		32.0	50.0	8.0	25.5	43.5	1.5	19.0	2 24 25.64	.....	0.69	12 25.83	2 36 50.78	50.58
	α Ceti.....		8.0	26.0	43.5	1.0	18.5	36.5	54.0	2 42 1.07	.....	0.25	12 25.83	2 54 26.65	26.90
	δ Arietis		43.5	2.5	21.0	39.5	58.0	17.0	35.5	2 50 39.57	.....	1.44	12 25.83	3 3 3.96	3.92
	α Persei.....		57.5	24.5	51.5	18.0	45.0	12.5	39.5	3 1 [illegible]	.....	4.81	12 25.83	3 13 39.96	39.36
29	η Tauri.....	E.	43.2	11.2	29.2	46.2	.....	.....	.....	3 41 19.95	+ 26.81	— 0.80	— 1 42.73	3 40 3.23	3.41
	λ Tauri.....		.....	.....	49.2	6.4	24.8	42.4	.....	3 54 15.70	— 8.91	0.91	1 42.75	3 52 23.06	22.92
	γ Tauri.....		5.2	23.6	42.0	0.0	18.0	36.4	54.4	4 13 59.94	.....	1.17	1 42.77	4 12 16.00	16.10
	α Tauri.....		8.8	26.8	45.2	3.2	22.0	40 4	58.4	4 29 3.54	.....	1.94	1 42.79	4 27 19.51	19.53
	Moon, 1st L....		20.4	38.8	58.0	16.4	35.2	54.4	13.2	4 39 16.63	.....	1.31	1 42.81	4 37 32.51	.....
	ι Tauri		55.4	13.2	34.0	52.8	12.0	30.8	49.6	4 55 52.97	.....	1.67	1 42.82	4 54 8.48	8.33
	α Aurigæ.....		9.2	34.4	59.6	24.8	50.4	15.2	40.8	5 7 24.91	.....	4.40	1 42.84	5 5 37.67	37.67

The following are the results from the observations at the observatory near the junction of the Gila and Colorado:

		h. m. s.
Oct.	3	7 38 47.04
	4	37.61
	5	33.82
	6	27.69
	7	33.70
	23	5.84
	24	31.95
	25	37 40.18
	26	38 31.64
	27	26.66
	28	23.62
	29	16.17
	30	21.74
	31	9.14

		h. m. s.
Nov.	1	7 38 30.58
	2	32.39
	3	29.66
	4	28.44
	5	30.30
	6	22.42
	20	32.43
	22	27.53
	23	23.44
	24	45.40
	25	14.99
	27	25.72
	29	25.25

	h. m. s.
Mean	7 38 25.75
Longitude of the same, computed in the field from the Greenwich ephemeris for 1849	7 38 12.53
Difference	13.22

	s.
Probable error of single observation	± 8.71
Probable error of mean result	± 1.71

III.—*Latitude of Camp Riley, near Initial Point on Pacific, determined*

Date.	5461 5507	5596 5690	5658 5708	5765 5937	6094 6199	6091 6492	6091 6598	6946 6492	6946 6598	6626 6642	6626 6647	6476 6642	6476 6647	6794 6741	6761 6814	6867 6903
	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
July 25	.....	45.09	.....	45.41	45.50	.....	.....	.....	.....	40.36	42.56	44.30	.....	37.52	.....	.....
26	.....	47.04	.....	43.88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27	44.97	49.50	.....	40.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
28	.....	45.06	.....	42.85	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aug. 2	.....	44.89	.....	42.10	43.82	.....	44.90	.....	.....	39.31	42.67	43.18	46.55	.....	.....	.....
3	45.14	.....	.....	.....	.....	44.49	44.46	.....	.....	.....	.....	.....	.....	.....	.....	.....
4	44.54	.....	.....	43.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	43.49	45.59	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	46.69	.....	.....	41.96	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11	.....	.....	41.18	46.06	.....	.....	.....	44.89	46.39	.....	.....	.....	.....	39.64	.....	46.61
13	.....	.....	.....	.....	.....	.....	.....	43.01	43.17	.....	.....	.....	.....	44.19	.....	41.79
14	.....	.....	.....	42.41	.....	45.58	45.14	.....	.....	.....	.....	.....	.....	41.38	.....	42.69
17	.....	.....	.....	42.47	.....	43.91	41.89	.....	.....	.....	.....	.....	.....	.....	.....	47.36
18	.....	.....	.....	45.08	.....	42.35	42.94	.....	.....	.....	.....	.....	.....	38.68	.....	44.97
	44.97	46.27	41.18	43.26	44.66	44.08	43.71	43.91	44.75	39.84	42.62	43.74	46.55	40.27	41.32	44.32

Date.	5918 5985	6091 6492	6091 6598	6946 6492	6946 6598	6652 6754	6661 6754	6678 6754	6865 6952	7035 7092	7035 7195	7055 7098	7055 7195	7178 7394	7193 7394	7491 7478
	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
Aug. 21	46.67	.....	45.39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22	.....	43.65	43.49	44.79	45.25	.....	.....	39.55	40.92	44.66	.....	45.83	.....	35.75	.....	.....
23	44.63	39.97	.....	.....	.....	40.34	41.56	39.45	37.60	44.07	.....	45.05	.....	.....	.....	.....
24	46.96	44.43	45.00	42.94	46.91	.....	.....	.....	41.17	49.69	47.72	48.59	46.62	36.17	38.60	46.34
25	46.22	45.65	46.66	.....	.....	43.13	44.34	42.65	41.71	44.72	43.51	44.55	43.26	.....	.....	.....
Sept. 4	.....	44.63	44.00	.....	.....	43.06	42.59	41.12	42.83	.....	.....	44.93	41.46	38.67	40.94	42.66
5	.....	47.68	41.45	.....	.....	.....	.....	39.00	37.72	.....	.....	.....	.....	.....	.....	.....

There are 190 results obtained from observations on eighty-two different stars.

	°	′	″
By giving the same weight to each observation (mean of all the observations) we have for the latitude ...	32	35	43.53
Latitude by giving to each pair a weight depending on the number of observations, (most probable).....	32	35	43.54
General mean of each night.....	32	35	43.73
General mean of each pair.....	32	35	43.56
General mean of all the observations	32	35	43.53

with a Zenith Telescope of 46-inch focal length: By W. H. Emory.

6959 7107	6959 7121	6959 7160	7193 7318	7418 7455	7547 7595	7651 7689	7759 7788	7827 7875	7908 7961	7997 8058	8056 8147	8058 8147	8268 8315	Mean of each night's observations.
"	"	"	"	"	"	"	"	"	"	"	"	"	"	° ′ ″
44.36	43.55	44.14	47.09	44.25	39.57	42.68	40.91	.....	.....	.....	.....	A...	.....	39 35 43.19
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43.42
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44.99
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44.96
.....	.....	.....	.....	43.04	40.81	.....	39.55	.....	44.37	.....	46 39	.....	.....	43.14
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44.79
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43.87
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44.51
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44.33
47.90	46.85	47.21	46.48	41.98	40.85	43.07	40.50	.....	40.52	.....	.....	.....	.....	43.95
44.56	45.36	.....	.....	.....	38.89	45.09	39.00	42 58	40.81	.....	.....	41.94	43.84	43.09
45.01	46.00	46.24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44.30
42.78	41.83	43.63	.....	43.76	.....	44.17	39.07	42.16	38.52	.....	.....	.....	.....	42.52
44.87	43.91	46.37	.....	41.70	.....	46.83	40.66	46.70	.....	41.85	.....	44.12	43.84	43.74
														39 35 43.97 Mean of each night.
44.80	44.92	45.52	47.08	42.95	40.03	44.35	*39.95	43.81	41.05	41.85	46.39	43.03	43.84	39 35 43.63 Mean of each pair.
														39 35 43.80 Mean of observa'ns.

* Rejected. 7759 not well determined.

7567 7598	7605 7622	7605 7547	7629 7696	7629 7698	7659 7696	7659 7698	7815 7912	7971 8094	7971 8083	8125 8227	8268 8315	Mean of each night's observations.
"	"	"	"	"	"	"	"	"	"	"	"	° ′ ″
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39 35 46.03
.....	41.10	44.87	.....	36.42	.....	43.93	46.33	39.92	42.00	42.15	.....	42.30
.....	.....	.....	.....	39.40	.....	46.76	44.43	40.41	37.90	43.39	.....	41.60
49.14	.....	.....	40.76	40.40	47.93	47.57	49.93	43.21	42.68	44.73	44.18	44.79
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	44.34
42.83	.....	.....	.....	37.13	.....	45.00	45.80	40.43	39.94	43.08	43.77	42.31
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	41.46
												39 35 43.96 Mean of each night.
												39 35 46.48 Mean of each pair.
												39 35 43.32 Mean of observ'ns.

Probable error in determinations of the latitude from a single pair..... ″ 1.48
Limit of probable error in determinations of the latitude from the results of all the pairs..... 0.198

IV.—*Observations for latitude at Observatory near the junction of the Gila and Colorado rivers: By Lieut. A. W. Whipple.*

Date.	7480 7528	7547 7595	7950 7997	8058 8146	8260 8312	7 66	6867 6893	7107 7120	7176 7206	7302 7310	
1849.	° ′ ″	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	″	″	″	″	° ′ ″
											*32 43 27.36
Oct. 6	.....	32 43 37.81	32 43 38.61	.....	32 43 48.97	32 43 51.99	.....	.....	.....	.....	32 43 37.16
7	28.44	.....	.....	.....	.....	.....	.....	.....	.....	.....	32 43 41.60
8	25.74	.....	42.49	41.31	44.94	47.93	.....	.....	.....	.....	32 43 43.17
9	29.04	.....	40.56	43.40	47.48	51.31	.....	.....	.....	40.43	32 43 44.94
10	.....	35.37	.....	43.21	42.69	50.93	44.31	41.96	36.89	.....	32 43 51.31
11	.....	.....	41.72	44.66	43.23	50.31	.....	41.39	38.10	.....	32 43 44.31
12	27.40	39.34	40.27	46.04	.....	54.44	.....	42.59	39.11	.....	32 43 42.63
13	26.05	36.54	.....	.....	.....	.....	.....	44.59	37.78	39.96	32 43 37.95
15	.....	37.76	39.97	40.39	42.66	.....	.....	.....	.....	39.47	32 43 39.99
Mean for each pair.	32 43 27.36	37.16	41.60	43.17	44.94	51.31	44.31	42.63	37.95	39.99	.....
Mean of nine pairs	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32 43 42.54

* Rejected.

V.—*Triangulation by which the observed latitude and longitude of Camp Riley was transferred to the Initial Point of the boundary on the Pacific: By Major Emory.*

MEASUREMENT OF THE BASE LINE.

(*Unit of measure, a metre graduated by Gambey, of Paris.*)

1st measurement, with rods made of seasoned red wood	4536.7895 metres.
2d measurement, with steel wires belonging to Señor Salazar, surveyor of the Mexican commission	4536.60 "
	2) 3895
Result adopted	4536.6947

SOLUTION OF THE TRIANGLE.

Stations.	No. of observations.	Observed angles.	Distribution and error.	Spherical excess.	Plane angles and distances.	Logarithms.
		° ″ ″	″		° ′ ″	
East base	24	37 25 57.5	+ 0.033	00	37 25 57.53	9.7837811
West base	16	107 34 1.9	+ 0.033	00	107 34 1.93	.....
Initial point	24	35 0 1.2	+ 0.033	00	35 0 1.93	9.7685949
			+ 0.1			
East base to west base					4536.39	3.6567391
East base to initial point					7540.59	3.8774051
West base to initial point					4807.56	3.6819252

Calculation of the Geographical Position of the Initial Point.

Azimuth of the line from east base to initial point determined by measurement of angle made with meridian of the observatory, and also by various measurements of the elongations of Polaris: Counting from the south towards the west, 24° 31′ 31″.

Latitude of east base situated precisely in the meridian of observatory at Camp Riley, and determined, by direct measurement, to be south of it 1″.2; north latitude, 32° 35′ 42″.33.

East base to initial point = K = 7540.59 metres, H = 32° 35′ 42″.33.
P = 117° 03′ 16″.5; Z = 24° 31′ 31″.

Log. K..... = 3.8774051
Log. $\frac{1}{N \sin. 1''}$ = 8.5093882
Log. u''..... = 12.3868933

1st term H = 32° 35′ 42″.33
2d term H = 3′ 42″.76
3d term H =
Lat. Initial Point = 32° 31′ 59″.57

(2d term H) log. $(1 + E^2 \cos.^2 H)$ = 0.0020139
Log. u'' = 2.3868933
Log. cos. Z = 9.9589355
Log. 2d term = 2.3478427
2d term = 222″.76

Log. u'' = 2.3868933
Log. sin. Z = 9.6181471
12.0050504
Log. cos. H = 9.9258689
2.0791815 = log. 120″

P..... = 117° 03′ 16″.5
$\frac{u'' \sin. Z}{\text{Cos. H.}}$ = 2′ 00″
Long. Int. Pt. = 117° 05′ 16″.5

3d term H log. u'' = 2.3868933
Log. sin. Z = 9.6181471
2.0050404
2
Log. $(u'' \sin. Z)^2$ = 4.0100808
Log. $(1 + e^2 \cos.^2 H)$ = 0.0020139
Log. $\frac{\text{Sin. } 1''}{2}$ = 4.3845449
Log. tang. H..... = 9.8057664
8.2024060

Calculation of the Geographical Position of Station "West Base."

Measured azimuth of base line = Z = 61° 57′ 28″.5. Base line = K = 4536.69 metres.

1st term H..... = 32° 35′ 42″.33
2d term H..... = 1′ 09″.23
3d term H..... = 0′ 00″.00
H. or W. base = 32° 34′ 33″.10

Log. K..... = 3.6567391
Log. $\frac{1}{N. \sin. 1''}$ = 8.5093882
Log. u''..... = 2.1661273
Log. $(1 + e^2 \cos.^2 H)$ = 0.0020139
Log. cos. Z..... = 9.6722077
1.8403489
2d term = 69″.23

Log. u''.....	= 2.1661273	3d term—	
Log. sin. Z.....	= 9.9457651	Log. u''.....	= 2.1661273
	2.1118924	Log. sin. Z.....	= 9.9457651
Log. cos. H	= 9.9256623		2.1118924
	2.1862301		2
2d term P = 153″.54 =	2′ 33″.54	Log. $(u'' \sin. Z)^2$	= 4.2237848
		Log. $(1 + e^2 \cos.^2 H)$	= 0.0020139
P.....	= 117° 03′ 16″.5	Log. $\frac{\text{Sin. } 1''}{2}$	= 4.3845449
2d term..... =	2′ 33″.54	Log. tang. H.....	= 9.8057664
P. or long. of West Base	= 117° 05′ 50″.04		8.4141100

Calculation of the Azimuth of the line from Initial Point of the Boundary to East Base.

Log K = 3.8774050 = 7540.59. $Z' = 180 + Z - \frac{u'' \sin. Z}{\text{Cos. } L'} \sin. \frac{1}{2}(L + L')$

$\frac{1}{\text{N. sin. } 1''}$	= 8.5093881	Measured Z =	24° 31′ 16″
Sin. Z	= 9.6181471		+ 15 err. in meridian.
	2.0049402		24° 31′ 31″
Cos. L′	= 9.9258689		180°
	2.0790713		204° 31′ 31″
$\frac{\text{Sin. } L + L'}{2}$	= 9.7309790		1′ 04″.5
64″.57	= 1.8100503	Z′ =	204° 30′ 26″.5

VI.—*Azimuth of straight line from Initial Point on the Pacific to junction of Gila and Colorado.*

In the computation for the direction of the line, the longitude of the initial point and the longitude of the junction of the Gila and Colorado are taken as determined in the field by the observations compared with the moon's place, as given in the Nautical Almanac (Greenwich.) On arriving at Washington, I obtained from Professor Airy his corresponding observations, made at Greenwich, and it will be seen that a change has been made in the absolute longitude of both places, but fortunately no material change is discoverable in the relative longitude of the two places. Now, an inspection of the formula used will show that the *difference* in longitude is the element used in determining the azimuth of the line connecting the two points. Hence the change deduced from comparison with the corresponding Greenwich observations does not affect this result.

The preceding pages show the process by which the latitude and longitude of Camp Riley was transferred to the initial point of the boundary on the Pacific.

A word on the subject of the transfer to the "junction" of the latitude and longitude of the observatory near that point; the distance between them was so small that the transfer may be considered as having been accomplished by direct measurement.

Lieutenant Whipple's report to me, November 30, 1849, gives—

	° ′ ″
The longitude of observatory, 7ʰ 38ᵐ 12ˢ.53; in arc	114 33 07.95
The longitude of junction	114 32 51.61
Difference	16.34

	° ′ ″
Latitude of observatory, (see report of November 24)	32 43 43.96
Latitude of junction	32 43 32.3
Difference	11.66

These, corresponding with my computations founded on the same data, were adopted; but it must be observed, to prevent future misunderstanding, that it was impracticable to measure the azimuth from the junction of the two rivers, (then under water,) and a point, B, (see sketch,) was selected in the azimuth produced, ascertained by direct measurement to be 73.5 feet south and 1,070 feet west of the junction, and here the monument was placed and the azimuth measured from it. The geographical position of this monument is, consequently,

	° ′ ″
In north latitude	32 43 31.6
Uncorrected longitude	114 33 04.3

The computation of the azimuth and length of the line of boundary extending from the initial point on the Pacific coast, near San Diego, to the junction of the Gila and Colorado, was based on the following assumption:

	° ′ ″
Latitude of initial point on the Pacific	32 31 59.63
Latitude of junction of Gila and Colorado	32 43 32.2
Difference of longitude	2 32 24.9

We compute the azimuth and distance by the formulæ given by *Puissant, Traité de Geodesie*, Ed. III, Vol. 2, p. 316, using the following notation:

a = equatorial radius — e = ellipticity = $\frac{a^2 - b^2}{b^2}$

b = polar radius — Log. e = 7.8273187

Z' = azimuth at the Gila, reckoned from the S. round by W.

Z'' = azimuth at the initial point — σ = distance in arc.

$$\tan. l' = \frac{b}{a} \tan. L' \qquad \tan. l'' = \frac{b}{a} \tan. L''$$

In the spherical triangle formed by l', l'', and P, we now compute the angles $180° - Z'$ and $Z'' - 180°$, the arc σ, and also l, = the latitude of the foot of the perpendicular from the pole, and obtain for a first approximation:

$Z' = 85° \ 33' \ 25''.05$ — $\sigma = 7739''.75$

$Z'' - 180° = 84° \ 11' \ 25''.21$ — $l = 32° \ 54' \ 22''.69$

Next we compute the correction $d\,P$, to be applied to the spheroidal difference of longitude P, by the formula

$$d\,P = -\sigma\,(\tfrac{1}{2}\,e - \tfrac{3}{8}\,e^3)\cos.\,l = +\,21''.72$$

And we get..... $P + d\,P = 2°\ 32'\ 46''.62$

Substituting this into the former computation, we obtain

$$Z' = 85°\ 34'\ 14''.41 \qquad \sigma = 7758''.10$$
$$Z'' - 180° = 84°\ 12'\ 02''.89 \qquad l = 32°\ 54'\ 16''.71$$

And by a second substitution of the latter values we obtain, finally,

$$Z' = 85°\ 34'\ 14''.49 \qquad d\,P = +\,21''.77$$
$$Z'' - 180° = 84°\ 12'\ 02''.95 \qquad \sigma = 7758''.15$$

We also compute σ' and σ'', the arcs from l' and l'' to the foot of the perpendicular l, viz: $\sigma' = 6°\ 52'\ 31''.5$; $\sigma'' = 9°\ 01'\ 49''.7$; and obtain the distance s in metres by the expression

$$\frac{s}{b} = \sigma\,(1 + \tfrac{1}{4}\,e\,\sin.^2 l - \tfrac{3}{64}\,e^2\,\sin.^4 l) + (\sin.\,2\,\sigma'' - \sin.\,2\,\sigma')\,(\tfrac{1}{8}\,e\,\sin.^2 l - \tfrac{1}{32}\,e^2\,\sin.^4 l) - \cdots$$

1st term	= +	239187.0
2d term.....	= +	113.8
3d term.....	= −	0.0
Distance s.....	=	239300.8 metres = 261692.0 yards = 148.689 miles.

Azimuth at initial point on Pacific coast ..... = 84° 12′ 02″.95

Azimuth at junction of Gila and Colorado..... = 85° 34′ 14″.49

Length of line of boundary connecting above points..... = 148.689 miles

B.

Determinations of boundary line from the Rio Colorado of the west, to the intersection of the 111th meridian of longitude, west of Greenwich, and parallel 31° 20′ north latitude: By Lieutenant N. Michler, Topographical Engineers U. S. A.

I.—AZIMUTH LINE—ASTRONOMICAL POSITIONS.

The longitude of the initial point on the Rio Colorado, twenty English miles below its junction with the Gila, as agreed upon by Lieutenant N. Michler, Topographical Engineers United States Army, on the part of the United States, and Francisco Jimenez, first engineer of the Mexican commission, on the part of Mexico, was determined to be 114° 48′ 44.53″ west of Greenwich.

This result was obtained by transferring the longitude of the monument near the junction to the initial point, by Lieutenant Michler's triangulation of the "twenty English miles," the longitude of said monument having been previously obtained from observations by Lieutenant A. W. Whipple, Topographical Engineers, Assistant United States Boundary Survey, deduced from corresponding observations at Greenwich.

	°	′	″	
Longitude of the monument	114	36	22.20	W. of Greenwich.
Difference of longitude between monument and initial point	+ 12	22.33		
Longitude of initial point	114	48	44.53	

	°	′	″	
The latitude of the initial point on the Rio Colorado was found to be.....	32	29	44.45	North.

This latitude was obtained by a mean of results from observations with zenith telescopes by Lieutenant Michler and Señor Jimenez, at their respective observatories near the initial point, (reduced to Lieutenant Michler's observatory,) as follows:

	° ′ ″	
Determination by Señor Jimenez	32 29 41.53	
Determination by Lieutenant Michler	32 29 41.77	
Mean latitude	32 29 41.65	North.

This latitude of the observatory was then transferred to the initial point, by triangulation, by Lieutenant Michler. By transferring the latitude of the monument near the junction to the same observatory, by two different triangulations, one by Lieutenant Michler and the other by Señor A. Diaz, second engineer Mexican commission, the following were the results:

	° ′ ″	
Known latitude of the monument near the junction	32 43 31.58	North.
Difference of latitude between monument and observatory, by Lieutenant Michler's triangulation	— 13 48.95	
Latitude of observatory	32 29 42.63	North.
Known latitude of the monument near the junction	32 43 31.58	North.
Difference of latitude between monument and observatory, by Señor Diaz's triangulation	— 13 48.39	
Latitude of observatory	32 29 43.19	North.
	32 29 42.63	"
Difference	00.56	

The azimuth of the line from the junction of the Colorado and Gila, to Lieutenant Michler's observatory, is, at the latter point, 36° 14′ 10″ northeast, and its length 104024.34 feet.

The azimuth of the boundary line from the initial point on the Colorado to the intersection of the 111th meridian, west of Greenwich, and the parallel of 31° 20′ north latitude, is at the initial point 71° 20′ 43″.8 southeast, and at the point of intersection of parallel and meridian 69° 19′ 45″.94 northwest; the length of this line = 382844.87 metres, = 418684.3 yards, = 237.63565 English miles.

Monument No. II, made of cast-iron plates, and pyramidal in form, was placed on the edge of the desert, at a distance from the initial point of 4522.9 yards; its latitude was computed to be 32° 29′ 01″.48 north; its longitude 114° 46′ 14″.43 west of Greenwich. The azimuth of the boundary line at this point was computed to be 71° 19′ 23″.18 southeast.

The longitude of the observatory of the Mexican commission at Quitobaquita, near monuments VII and VIII, as determined by Señor Jimenez, first engineer, from ten lunar culminations, commencing July 23, 1856, and ending August 2, 1856, inclusive, was found to be 112° 52′ 25″.73 (7*h*. 31*m*. 29.775*s*.) west of Greenwich.

The latitude of observatory at Quitobaquita, as determined by Señor Jimenez, first engineer, from forty observations upon eight pairs of stars with zenith telescope, was found to be 31° 56′ 26″.57 north.

II.—*Results of calculations of geodetic latitudes and longitudes of points of triangulation of a line "twenty English miles in length," extending from the Monument, near the junction of the Gila and Colorado, to the Initial Point of the new azimuth line. Triangulation by Lieut. N. Michler, Topographical Engineers U. S. A. Computer, John O'Donoghue. Instrument, Bruner Theodolite.*

Name of station.	Letter of station.	Name of side.	Name of angle.	Azimuth.	Angle of station.	Length of sides in feet.	Difference of latitude + north.	Difference of latitude — south.	Difference of longitude + west.	Difference of longitude — east.	Latitude of station.	Longitude of station.
				° ′ ″	° ′ ″		′ ″	′ ″	′ ″	′ ″	° ′ ″	° ′ ″
Monument	M	M C		10 13 15.7 S.W.		4,921.16		— 0 47.9230	+ 0 10.2223		32 43 31.6	114 36 22.20
Sierra Prieta	C	C H	F C H	21 40 37 S.E.	156 53 9	22,988.95		— 3 31.4058		— 1 39.3261	32 42 43.677	114 36 32.4223
East stations	H	H K	C H K	48 3 25 S.W.	110 16 51.5	19,247.3		— 2 7.3320	+ 2 47.3941		32 39 12.2712	114 34 53.0962
	K	K Q	H K Q	20 29 39 S.W.	207 32 15.6	6,606.97		— 1 1.2414	+ 0 27.0420		32 37 4.9392	114 37 40.4903
	Q	Q R	K Q R	67 16 26 S.W.	133 12 58.8	4,030.91		— 0 15.4117	+ 0 43.4621		32 36 3.6978	114 38 7.5323
	R	R W	Q R W	2 3 12 S.E.	249 19 14.7	7,161.32		— 1 10.8210		— 0 2.9990	32 35 48.2861	114 38 50.9944
	W	W V	R W V	32 28 8 S.W.	145 28 41.4	6,825.12		— 0 56.9812	+ 0 42.8146		32 34 37.4651	114 38 47.9954
	V	V X′	W V X′	32 2 22 S.W.	180 25 23	5,460.98		— 0 32.7200	+ 0 33.8478		32 33 40.4839	114 39 30.8100
	X′	X′ Y′	V X′ Y′	56 56 52 S.W.	155 5 11.5	2,459.80		— 0 13.2763	+ 0 24.0835		32 33 7.7639	114 40 4.6578
	Y′	Y′ Z′	X′ Y′ Z′	37 44 30 S.W.	199 12 8.8	9,677.29		— 1 15.7318	+ 1 9.1879		32 32 54.4676	114 40 28.7413
	Z′	Z′ B′	Y′ Z′ B′	25 35 37 S.W.	192 8 16.3	14,028.38		— 2 5.2035	+ 1 10.7553		32 31 38.7558	114 41 37.9292
	B′	B′ D′	Z′ B′ D′	78 29 51 S.W.	127 5 7.9	16,530.94		— 0 45.7492	+ 3 9.1158		32 29 33.5523	114 43 48.6845
	D′	D′ F′	B′ D′ F′	63 50 36 S.W.	142 17 35	12,568.51	+ 0 54.8439		+ 2 11.7016		32 28 47.8031	114 45 57.8003
Observatory near initial point, on Colorado	F′										32 29 42.6470	114 48 9.5019
Monument	M	M F		15 59 42.8 N.W.		2,513.09	+ 0 23.9047		+ 0 8.1074		32 43 31.6	114 36 22.20
Flag Staff (Fort Yuma)	F	F P	P F G	83 55 37 S.W.	99 55 25.4	33,944.60		— 0 35.7091	+ 6 35.1297		32 43 55.5047	114 36 30.3074
Pilot Knob	P	G P	F P G	51 11 20 S.E.	44 56 36.7	33,808.90		— 3 29.7844		— 5 8.1915	32 43 19.7956	114 43 5.4371
West stations	G	G L	P G L	18 22 1 S.W.	249 30 34.7	19,293.25		— 3 0.5360	+ 1 10.8218		32 39 50.0112	114 37 57.2456
	L	L S	G L S	43 30 0 S.W.	205 8 37.2	4,216.71		— 0 30.2684	+ 0 33.9338		32 36 49.4752	114 39 8.0674
	S	Q T	L S T	8 55 17 S.W.	145 25 35.6	9,492.13		— 1 32.7996	+ 0 17.2045		32 36 19.2068	114 39 42.0012
	T	T W	S T W	20 11 14 S.W.	191 16 6.2	10,055.98		— 1 33.3977	+ 0 40.5466		32 34 46.4149	114 39 59.2057
	W	W Z	T W Z	57 49 27 S.W.	217 38 34.5	9,572.11		— 0 50 4506	+ 1 34.6498		32 33 13.0165	114 40 39.7523
	Z	Z A′	W Z A′	37 13 59 S.W.	159 24 23.3	10,754.1		— 1 31.7140	+ 1 22.2532		32 32 22.5259	114 42 14.4021
	A′	A′ C′	Z A′ C′	69 25 20 S.W.	212 12 5	15,339.12		— 0 53.3885	+ 2 47.6849		32 30 50.8519	114 43 36.6553
	C′	C′ F′	A′ C′ F′	80 33 0 S.W.	191 9 10	9,131.91		— 0 14.8490	+ 1 45.1842		32 29 57.4634	114 46 24.3402
Observatory near initial point, on Colorado	F′										32 29 42.6144	114 48 9.5294
First determination by east stations of triangles											32 29 42.6470	114 48 09.5019
Second determination by west stations of triangles											32 29 42.6144	114 48 09.5294
											85.2614	19.0943
Mean latitude and longitude of observatory near initial point											32 29 42.6307	114 48 09.512

"The base line of the triangulation of the twenty English miles to a point on the Colorado from its junction with the Gila," was measured by Lieut. N. Michler, corps topographical engineers, with two iron rods, "A" and "B," corresponding with rod "B," in the possession of Mr. R. D. Cutts, U. S. Coast Survey, the length of which is 4.0002457 metres at 32° Fahrenheit. The length of one metre, at 32° Fahrenheit, is equal to 39.3685034 inches at 62° Fahrenheit of the standard made by Troughton.

Rate of expansion of rods for 1° Fahrenheit, .000006963535.

The total length of the base, as computed by John O'Donoghue, computer, is 5,867 feet 5.9 inches.

Table showing the length of rods, at different temperatures, of the American and English Imperial Standard.

Temperature of iron rods.	Length of rods at this temperature, of American standard.	Length of rods at this temperat'e, of the English imperial standard.	Temperature of iron rods.	Length of rods at this temperature, of American standard.	Length of rods at this temperat'e, of the English imperial standard.
°	*Inches.*	*Inches.*	°	*Inches.*	*Inches.*
52	157.5056195	157.512060	62	157.5165855	157.523070
53	.5067161	.513161	63	.5176821	.524171
54	.5078127	.514262	64	.5187787	.525272
55	.5089093	.515363	65	.5198753	.526373
56	.5100059	.516464	66	.5209719	.527474
57	.5111025	.517565	67	.5220685	.528575
58	.5121991	.518666	68	.5231651	.529676
59	.5132957	.519767	69	.5242617	.530777
60	.5143923	.520868	70	.5253583	.531878
61	.5154889	.521969			

Table showing the quantity to be taken from the length of the measuring-rod at the different elevations.

Angle of elevation.	Sum to be subtracted from the length of the rod.	Angle of elevations.	Sum to be subtracted from the length of the rod.
° ′	*Inches.*	° ′	*Inches.*
0 00	0.0000000	0 35	0.0081595
0 05	0.0001733	0 40	0.0106641
0 10	0.0006615	0 45	0.0134995
0 15	0.0014964	0 50	0.0166656
0 20	0.0026612	0 55	0.0201626
0 25	0.0041585	1 00	0.0239903
0 30	0.0061275		

The point "F'" was Lieut. Michler's observatory, and distant from the junction of the Colorado and Gila, in a straight line, 104024.34 feet; the azimuth of this line, at the point "F'," is 36° 14′ 10″ N. E., and its length is 1575.66 feet short of twenty miles. (See results of calculations of geodetic latitudes and longitudes of points of triangulation, &c.)

The latitude of point "F'," as obtained from triangulation, is 32° 29′ 42″.64 N., and longitude 114° 48′ 09″.51 west of Greenwich. The latitude used, however, is that obtained from observations with zenith telescope, and is 32° 29′ 41″.65 N.; but the longitude taken is that obtained by triangulation.

The initial point, in the middle of the Colorado, was determined by prolonging the line from the junction, passing through "F'" 1575.66 feet, measured with the two iron rods, "A" and

"B," thus laying off a radius of twenty miles. At the extremity of this line, a perpendicular was erected, or, in other words, a tangent was drawn to the circumference of a circle with that radius and the junction as a centre, and, by means of the following table, the circle was described.

Co-ordinates of points of the circle.

Abscissas in feet, measured along the tangent.	Corresponding ordinates, in feet, measured on perpendiculars to the tangent.	Abscissas in feet, measured along the tangent.	Corresponding ordinates, in feet, measured on perpendiculars to the tangent.
Feet.		*Feet.*	
0 =	0.00	1,300 =	8.29
100 =	0.04745	1,400 =	9.30
200 =	0.19	1,500 =	10.67
300 =	0.427	1,600 =	12.148
400 =	0.759	1,800 =	15.37
500 =	1.186	2,000 =	18.90
600 =	1.708	2.200 =	22.96
700 =	2.325	2,400 =	27.33
800 =	3.037	2,600 =	33.00
900 =	3.843	3,000 =	42.66
1,000 =	4.74	5,000 =	118.10
1,100 =	5.74	10,000 =	472.2
1,200 =	6.83		

A table to lay out on the ground a portion of the circumference of a circle whose radius is twenty miles.

First take a point twenty miles from the mouth of the Gila, and having the direction of the line joining this point and the mouth of the Gila, protract a straight line, making an angle of 88° 34′ 02″.8522 with this line; or prolong a line that will make an angle of 1° 25′ 57″.1478 with the tangent to the circle at the point; then run 5,280 feet on this line, and this will give you a second point on the circle; then place your instrument alternately at the second and first points, and lay off the following angles with this chord of a mile long, and their intersections will be so many points in the circumference of the circle.

	First point.	Second point.	Intermediate points of circumference.
	° ′ ″	° ′ ″	
1	0 06 36.70	1 19 20.44	1st.
2	0 13 13.41	1 12 43.74	2d.
3	0 19 50.11	1 6 7.03	3d.
4	0 26 26.81	0 59 30.33	4th.
5	0 33 3.52	0 52 53.63	5th.
6	0 39 40.22	0 46 16.92	6th.

Having come to a point more than half way, reverse the readings, and they will give you other points commencing near the second point. The greatest distance of the periphery from this chord is about thirty-three feet.

III.—*Tabulation of results for the latitude of astronomical station at the Initial Point on the Rio Colorado, twenty English miles below its junction with the Gila, derived from observations made with zenith telescope of Wurdemann, on sixteen pairs of stars. Observer, Lieut. N. Michler, Corps Topographical Engineers, U. S. Army. Computer, John O'Donoghue.*

Date.	1st pair.	2d pair.	3d pair.	4th pair.	5th pair.	6th pair.	7th pair.	8th pair.	9th pair.
	N. 589 G. C. S. 560 G. C.	N. 705 S. 713	N. 791 S. 793	N. 796 S. 804	N. 706 S. 805	N. 812 S. 833	N. 850 S. 845	N. 859 S. 864	N. 894 S. 934
1855.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
March 17	.....	32 29 37.16	.....	32 29 38.63	32 29 36.77	32 29 41.21	.....	.....	.....
18	32 29 40.96	42.06	.....	41.11	38.60	.....	32 29 38.71	.....	.....
April 2	.....	.....	32 29 45.94	.....	.....	42.14	.....	32 29 38.94	.....
3	.....	48 57	.....	40.45	37.97	.....	45.68	.....	.....
4	.....	.....	.....	.....	48.87	.....	44.05	.....	.....
5	.....	47.68	.....	38.34	.....	41.93	39.80	.....	32 29 36.37
6	.....	.....	.....	42.64	40.13	.....	44.12	40.00	44.98
Lat. by a mean of each pair	32 29 40.96	32 29 43.87	32 29 45.94	32 29 40.93	32 29 40.47	32 29 41.53	32 29 42.47	32 29 39.12	32 29 40.67

Tabulation of results—Continued.

Date.	10th pair.	11th pair.	12th pair.	13th pair.	14th pair.	15th pair.	16th pair.	1st result.	Final result.
	N. 1010 S. 1012	N. 1044 S. 1036	N. 1044 S. 1046	N. 1062 S. 1089	N. 1063 S. 1089	N. 1064 S. 1089	N. 1157 S. 1175	Latitude by a mean of all the pairs.	
1855.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
March 17	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	.....	.....	.....	.....	.....	.....	.....	.....	.....
April 2	.....	32 29 38.25	.....	.....	.....	.....	32 29 46.74	.....	.....
3	.....	40.80	32 29 38.90	.....	.....	.....	.....	.....	.....
4	32 29 47.32	39.80	.....	.....	.....	.....	.....	.....	.....
5	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	.....	.....	38.55	32 29 40.04	32 29 41.19	32 29 39.45	.....	.....	.....
Lat. by a mean of each pair	32 29 47.32	32 29 39.62	32 29 38.73	32 29 40.04	32 29 41.19	32 29 39.45	32 29 46.74	32 29 41.77	32 29 41.77

REMARKS.—The zenith telescope suffered very material injury in its transportation, in consequence of the counterpoise having been separated from the instrument by the breaking of a screw, and knocked about among the other parts. The tangent screws were mostly bent, the micrometer slightly injured, and the spider lines and levels all broken. Being in a country where the levels could not be replaced, the not very sensitive ones of a large bronze theodolite had to be substituted for those broken, and the other injuries repaired by such means as were at hand.

Computations from observations on Polaris, western elongation, for the determination of the value of one division of the micrometer attached to zenith telescope, by Wurdemann, for the U. S. Boundary Commission. March 23, 1855.

No.	Micrometer readings.	Times of observat'n by chron'r.	Time from elongation.	Correct'n for H.	Reduced time.	Nos.	Difference of time.	Difference of time in arc.	Reduction to the equator.	Diff. of micrometer readings.	Resulting values of one division.
		h. m. s.	m.	s.	h. m. s.		m. s.	° ′ ″	′ ″		″
1	300	6 15 48.0	20.91	1.8	6 15 49.8	1 to 6	8 29.7	2 7 25.5	3 15.0	300	0.63000
2	250	17 19.0	19.52	1.4	17 13.4	5	7 6.9	1 46 33.0	2 43.1	250	0.63200
3	150	20 5.8	16.62	0.9	20 6.7	4	5 42.4	1 25 36.0	2 11.0	150	0.63500
4	100	21 31.5	15.19	0.7	21 32.2	3	4 16.9	1 4 13.5	1 38.3	100	0.63500
5	50	22 55.5	13.79	0.5	22 56.0	2	1 23.6	20 54.0	32.0	50	0.64000
6	00	24 19.2	12.40	0.3	24 19.5	2 to 6	7 6.1	1 46 31.5	2 43.0	250	0.63920
7	100	27 9.2	9.56	0.1	27 9.3	6 to 14	16 44.7	4 11 10.5	6 25.1	600	0.64183
8	150	28 34.0	8.10	0.1	28 34.1	13	15 20.5	3 50 7.5	5 51.9	550	0.63898
9	250	31 20.0	5.38	0.0	31 20.0	12	13 59.5	3 29 52.5	5 21.0	500	0.64200
10	350	34 11.0	2.53	0.0	34 11.0	11	12 35.5	3 8 52.5	4 49.0	450	0.64222
11	450	36 55.0	0.18	0.0	36 55.0	10	9 51.5	2 27 52.5	3 46.2	350	0.64630
12	500	38 19.0	1.59	0.0	38 19.0	9	7 0.5	1 45 7.5	2 41.1	250	0.64440
13	550	39 40.0	2.94	0.0	39 40.0	8	4 14.6	1 3 39.0	1 37.4	150	0.64933
14	600	41 4.2	4.34	0.0	41 4.2	7 to 14	13 54.9	3 28 43.5	5 19.3	500	0.63860

Mean $= \frac{9\ 04939}{14} = 0''.64638$ by 1st series. Sum = 9.04939

Remarks.

Chronometer slow..... = 28m. 41s.490
Time, by chronometer, of western elongation of Polaris..... = 6h. 36m. 43s.350
Declination of star..... = 88° 39′ 17″.4

Observer, Lieut. N. Michler, Top. Engineers, U. S. A. Computer, Hugh Campbell.

Computations for the value of one division of the micrometer, &c.—Continued.

No.	Micrometer readings.	Time of observat'n by mic'ter.	Time from elongation.	Correct'n for H.	Reduced time.	Nos.	Difference of time.	Difference of time in arc.	Reduction to the equator.	Diff. of micrometer readings.	Value of one divis'n of the micrometer.
		h. m. s.	m.	s.	h. m. s.		m. s.	° ′ ″	′ ″		″
1	300	6 15 48.0	20.91	1.8	6 15 49.8	7 to 13	13 54.9	3 7 40.5	4 47.1	450	0.63800
2	250	17 19.0	19.52	1.4	17 13.4	12	12 30.7	2 47 25.5	4 16.1	400	0.64025
3	150	20 5.8	16.62	0.9	20 6.7	11	11 9.7	2 26 25.5	3 44.0	350	0.64000
4	100	21 31.5	15.19	0.7	21 32.2	10	9 45.7	1 45 25.5	2 41.4	250	0.64560
5	50	22 55 5	13.79	0.5	22 56.0	8 to 14	12 30.1	3 7 31.5	4 46.9	450	0.63533
6	0	24 19.2	12.40	0.3	24 19.5	13	11 5.9	2 46 28.5	4 14.7	400	0.63675
7	100	27 9.2	9.56	0.1	27 9.3	12	9 44.9	2 26 13.5	3 43.7	350	0.63914
8	150	28 34.0	8.10	0.1	28 34.1	11	8 20.9	2 5 13.5	3 11.6	300	0.63866
9	250	31 20.0	5.38	0.0	31 20.0	14 to 1	25 14.4	6 18 36.0	9 38.3	900	0.64255
10	350	34 11.0	2.53	0.0	34 11.0	13 to 2	22 26.6	5 36 39.0	8 34.4	800	0.64300
11	450	36 55.0	0.18	0.0	36 55.0	12 to 3	18 12.3	4 33 4.5	6 57.5	650	0.64230
12	500	38 19.0	1.59	0.0	38 19.0	11 to 4	15 22.8	3 50 42.0	5 52.8	550	0.63900
13	550	39 40.0	2.94	0.0	39 40.0	14 to 2	23 50.8	5 57 42.0	9 6.5	850	0.64094
14	600	41 4.2	4.34	0.0	41 4.2	13 to 3	19 33.3	4 53 19.5	7 28.4	700	0.64086

Mean $= \frac{8.96018}{14} = 0''.64001$ by 2d series. Sum = 8.96018

	″		
1st series.....	= 0.64638	1st sum.....	= 9.04939
2d series.....	= 0.64001	2d sum.....	= 8.96018
Mean.....	= 0.643195		18.00957

$\frac{18.00957}{28} = 0''.643198$ = mean of 28 combinations.

	″
1st mean.....	= 0.643195
2d mean.....	= 0.643198
Result by Polaris..	= 0.643196

Observer, Lieut. N. Michler, Top. Engineers, U. S. A. Computer, Hugh Campbell.

Computations from observations on δ Ursæ Minoris, eastern elongation, for the value of one division of the micrometer. March 23, 1855.

No.	Micrometer readings.	Time of obsevat'n by chron'r.	Time from elongation.	Correct'n for H.	Reduced time.	No.	Micrometer readings.	Time of obsevat'n by chronometer.	Time from elongation	Correct'n for H.	Reduced time.
		h. m. s.	m.	s.	h. m. s.			h. m. s.	m.	s.	h. m. s.
1	400	11 46 25.0	3.9	0.0	11 46 25.0	19	1000	12 03 08.0	19.7	0.4	12 03 08.4
2	350	46 59.5	3.4	0.0	46 59.9	20	1050	03 40.5	13.1	0.4	03 40.1
3	300	47 36.5	2.8	0.0	47 36.5	21	1100	04 15.8	13.9	0.5	04 15.3
4	250	48 13.5	2.1	0.0	48 13.5	22	1150	04 52.5	14.4	0.6	04 51.9
5	200	48 50.0	1.5	0.0	48 50.0	23	1250	06 04.0	15.6	0.7	06 03.3
6	150	49 23.0	1.0	0.0	49 23.0	24	1300	06 40.8	16.3	0.8	06 40.0
7	100	49 58.8	0.4	0.0	49 58.8	25	1350	07 16.0	16.8	0.9	07 15.1
8	50	50 35.0	0.2	0.0	50 35.0	26	1400	07 51.6	17.4	1.0	07 50.6
9	0	51 08.5	0.7	0.0	51 08.5	27	1500	08 58.0	18.5	1.2	08 56.8
10	50	51 43.0	1.3	0.0	51 43.0	28	1550	09 33.0	19.1	1.3	09 31.7
11	100	52 19.0	1.9	0.0	52 19.0	29	1600	10 08.0	19.7	1.4	10 06.6
12	300	54 46.0	4.3	0.0	54 46.0	30	1700	11 21.8	20.9	1.6	11 20.0
13	350	55 19.0	4.9	0.0	55 19.0	31	1800	12 31.5	22.1	2.0	12 29.5
14	450	56 32.0	6.0	0.0	56 32.0	32	1850	13 07.0	22.7	2.3	13 04.7
15	550	57 45.0	7.3	0.0	57 45.0	33	1900	13 44.5	23.3	2.3	13 42.9
16	750	12 00 04.5	9.6	0.1	12 00 04.4	34	1950	14 19.6	23.9	2.6	14 17.6
17	850	01 17.0	10.9	0.2	01 16.8	35	2000	14 57.0	24.5	2.8	14 54.0
18	900	01 51.6	11.4	0.2	01 51.4						

Remarks.

Time by chronometer of eastern elongation of δ Ursæ Minoris..... 11h. 50m. 24s.760
Chronometer slow..... = 28m. 41s.49
Declination of star..... = 86° 35′ 39″.5.

Combination of results for the determination of one division of the micrometer, derived from observations on δ Ursæ Minoris near eastern elongation.

Nos.	Microm'er divisions.	Differences of times.	Differences of times in arc.	Reduction to the equator.	Values of one division.	Nos.	Microm'er divisions.	Differences of times.	Differences of times in arc.	Reduction to the equator.	Values of one div'n.
		m. s.	° ′ ″	′ ″	″			m. s.	° ′ ″	′ ″	″
1 to 18	1300	15 26.4	3 51 36.0	13 45.3	.63484	1 to 35	2400	28 29.2	7 07 18.0	25 20.0	.63333
2 to 19	1350	16 05.9	4 01 28.5	14 20.5	.63888	2 to 34	2300	27 17.5	6 49 22.5	24 16.5	.63317
3 to 20	1350	16 03.6	4 00 54.0	14 18.4	.63585	3 to 33	2200	26 06.0	6 32 00.0	23 15.0	.63409
4 to 21	1350	16 01.8	4 00 27.0	14 17.8	.63547	4 to 32	2100	24 53.5	6 13 22.5	22 09.0	.63085
5 to 22	1350	16 01.9	4 00 28.5	14 16.9	.63474	5 to 31	2000	23 39.5	5 54 52.5	21 03.3	.63165
6 to 23	1400	16 40.3	4 10 04.5	14 51.0	.63642	6 to 30	1850	21 57.0	5 29 15.0	19 39.4	.63373
7 to 24	1400	16 41.9	4 10 18.0	14 51.9	.63771	7 to 29	1700	20 07.8	5 01 57.0	17 55.4	.63288
8 to 25	1400	16 40.1	4 10 01.5	14 50.9	.63635	8 to 28	1600	18 56.7	4 44 10.5	16 59.3	.63269
9 to 26	1400	16 42.1	4 10 31.5	14 52.7	.63764	9 to 27	1500	17 48.3	4 27 04.5	15 51.5	.63433
10 to 27	1450	17 13.8	4 18 27.0	15 20.8	.63503	10 to 26	1350	16 08.6	4 02 09.0	14 22.8	.63911
11 to 28	1450	17 12.7	4 18 10.5	15 19.8	.63433	11 to 25	1250	14 57.0	3 44 15.0	13 19.2	.63835
12 to 29	1300	15 20.6	3 50 09.0	13 40.1	.63077	12 to 24	1000	11 54.8	2 58 42.0	10 37.0	.63700
13 to 30	1350	16 01.0	4 00 15.0	14 16.1	.63474	13 to 23	900	10 45.0	2 41 15.0	9 35.9	.63988
14 to 31	1350	15 57.5	3 59 22.5	14 13.0	.63165						
15 to 32	1300	15 19.7	3 49 55.5	13 39.3	.63093						
16 to 33	1100	13 00.3	3 15 04.5	11 36.3	.63300						
17 to 34	1100	13 00.2	3 15 03.6	11 35.2	.63300						
18 to 35	1100	13 09.8	3 15 42.0	11 37.5	.63469						
				Mean =	0.63466						

1st series—mean	0.63490
2d series—mean	0.63466
Result by δ Ursæ Minoris	0.63479
Result by Polaris	0.63319
Final result	0.63399

Value of one division of the micrometer from observations on Polaris (western elongation) and δ Ursæ Minoris (eastern elongation) is 0″.63399.

Observer, Lieut. N. Michler, U. S. Topographical Engineers. Computer, Hugh Campbell.

IV.—*Table showing the triangulated distances, in metres and yards, between the different monuments of the survey of that portion of the boundary line running from the Initial Point, on the Colorado river, to the intersection of the parallel* 31° 20′ 00″ *north latitude, and the meridian* 111° 00′ 00″ *west of Greenwich.*

Triangulation by Lieut. N. Michler, Mr. A. C. V. Schott, and Señor A. Diaz.

	Metres.	Yards.	Remarks.
From Initial Point, on the Colorado river, to Monument I...	964.62	1054.9214	Monument I, in River bottom, near the bank.
Monument I to Monument II	3171.12	3467.9793	Monument II, Iron monument, on desert.
Monument II to Monument III	829.81	907.4913	Monument III, erected on desert.
Monument III to Monument IV	72170.00	78926.0790	Monument IV, Sierra de las Tinajas Altas.
Monument IV to Monument V	44393.34	48549.1515	Monument V, Sierra del Tule.
Monument V to Monument VI	57633.19	63028.3593	Monument VI, Sierra del Agua Dulce.
Monument VI to Monument VII	13203.04	14439.0215	Monument VII, near Rancho de Quitobaquita.
Monument VII to Monument VIII	877.61	959.7680	Monument VIII, near Rancho de Quitobaquita.
Monument VIII to Monument IX	17296.65	18918.0354	Monument IX, Sierra de Sonoyta.
Monument IX to Monument X	23405.35	25598.4044	Monument X, west ridge of Sierra de la Nariz.
Monument X to Monument XI	4186.00	4571.3040	Monument XI, on the wagon road from Cobota to Sonoyta.
Monument XI to Monument XII	2703.97	3055.5230	Monument XII, east ridge of Sierra de la Nariz.
Monument XII to Monument XIII	44698.76	48883.1629	Monument XIII, on the road from Tubac to Cobota.
Monument XIII to Monument XIV	18986.27	20763.6403	Monument XIV, Sierra de la Union.
Monument XIV to Monument XV	26493.60	*28973.7560	Monument XV, Sierra del Pozo Verde.
Monument XV to Monument XVI	14299.57	15058.6301	Monument XVI, near Ojos de los Granizos.
Monument XVI to Monument XVII	3519.11	3848.5458	Monument XVII, Sierra de Sonora.
Monument XVII to Monument XVIII	27902.77	30580.4599	Monument XVIII, Sierra de los Pajaritos.
Monument XVIII to Monument XIX	5261.97	5754 5609	Monument XIX, Sierra de los Pajaritos.
Monument XIX to intersection of parallel 31° 20′ N. latitude, and meridian 111° west of Greenwich..	409.19	447.4967	Monument (intersection of meridian and parallel) Sierra de los Pajaritos.
Total length of line	382844.87	418684.9807	

C.

Astronomical observations for establishing the 111th meridian of longitude west of Greenwich, and for determining the parallels 31° 47′ and 31° 20′ north latitude: By John H. Clark.

The four manuscript volumes which have been submitted to the U. S. Commissioner, embrace a complete tabulation of all the observations, both for latitude and longitude, made along the parallels of 31° 47′ and 31° 20′. It will be seen, by a reference to these volumes, that each of the stations has been determined in latitude with a zenith telescope, (T. & S.,) by about one hundred observations, and two in longitude, with a transit of thirty-six inches focal length, by observations on the moon and moon culminating stars.

In accordance with the direction of the Commissioner, the stars for latitude were at first selected exclusively from the Greenwich Twelve-year catalogue. At Espia, however, it was found that this catalogue no longer afforded, in that portion of the heavens then observable, a sufficient number of pairs that would fulfil the conditions required for satisfactory results. It was therefore deemed expedient, in the exigencies of the survey, to rely subsequently almost wholly upon the British Association catalogue.

It was found, by combining the results of observations on about thirty pairs of stars taken from this catalogue, that any error in the final result arising from errors of polar distances was materially reduced; and although, by comparing the means of the observations on each pair, there seemed to be in some cases errors of polar distances developed, all the results were nevertheless incorporated to obtain the one adopted; nor was a single observation rejected because of its apparent inconsistency or want of parallelism with any previous or subsequent result obtained by it or by any other pair, except at one station, (Agua del Perro,) where the instrument was mounted on a rock, (no timber being attainable,) and the observations otherwise rendered objectionable by the violence of the wind. Thus the result of every pair, whether high or low, and without reference to the "general run," has been included in the "means" used to obtain the latitude adopted.

A subsequent and careful revision in the office of the computations made in the field has disclosed no considerable error.

A brief summary of the observations and results of all the stations, and a reference to the tables which are appended, are here given:

1. The observations at Los Nogales for determining the 111th degree of longitude west of Greenwich, extending through two lunations, and computed from data furnished by the Nautical Almanac, gave the result as shown by Table I, 110° 51′ 01″.95, (7ʰ 23ᵐ 24ˢ.13). The latitude deduced from 120 observations on 29 pairs of stars, taken from the British Association catalogue, is (see Table II) 31° 21′ 00″.48.

2. Seventy-three observations on 23 pairs of stars, selected from British Association catalogue, give for the latitude of the station near the head of Rio Santa Cruz, (Table III) 31° 17′ 56″.33.

3. At San Bernardino there were 57 observations on 21 pairs from British Association catalogue, and the latitude deduced therefrom, (Table IV,) 31° 19′ 40″.38.

4. The result deduced from 97 observations on 28 pairs of stars gives for the latitude of San Luis spring (Table V) 31° 20′ 31″.51.

5. At Agua del Perro there were 81 observations on 25 pairs of stars selected from both cata-

logues, (British Association catalogue and Greenwich catalogue,) and the latitude deduced, (Table VI,) 31° 20′ 57″.56.

6. The observations at Espia, made on 23 pairs of stars, partly from the Greenwich Twelve-year catalogue and partly from the British Association catalogue, amount to 81, and give for the latitude (Table VII) 31° 20′ 56″.45.

7. The latitude of Carrizalillo, resulting from 72 observations on 14 pairs of stars, selected entirely from the Greenwich Twelve-year catalogue, is (Table VIII) 31° 50′ 55″.23; longitude, (Table IX) 7ʰ 11ᵐ 44ˢ.26 = 107° 56′ 03″.9.

8. The result for the initial point on the Rio Grande, obtained from 108 observations on 22 pairs of stars, selected also exclusively from the Greenwich Twelve-year catalogue, is (Table X) 31° 46′ 51″.29.

TABLE I.

Results for longitude of astronomical station at Las Nogales, east of the intersection of the 111*th degree of longitude and the parallel of* 31° 20′ *north latitude.*

Date.	Authority for elements used.	Results for moon's 1st limb.	Date.	Authority for elements used.	Results for moon's 2d limb.	Date.	Authority for elements used.	Results for moon's 1st limb.	Date.	Authority for elements used.	Results for moon's 2d limb.
1855.		h. m. s.	1855.		h. m. s.	1855.		h. m. s.	1855.		h. m. s.
May 24	N. A. A. Rs.	7 23 19.20	May 30	N. A. A. Rs.	7 23 23.24	June 22	N. A. A. Rs.	7 23 42.93	June 28	N. A. A. Rs.	7 23 16.76
25	.....do.....	20.41	31	.....do.....	26.71	26	.....do.....	15.68	30	.....do.....	17.14
26	.....do.....	27.92							July 1	.....do.....	20.78
28	.....do.....	29.87									
29	.....do.....	25.78									
Mean longitude from moon's 1st limb.....7h. 23m. 25.94s.			Mean longitude from moon's 2d limb.....7h. 23m. 24.97s. Mean longitude from moon's 1st limb.....7h. 23m. 25.94s.			Mean longitude from moon's 1st limb.....7h. 23m. 22.40s.			Mean longitude from moon's 2d limb.....7h. 23m. 18.93s. Mean longitude from moon's 1st limb.....7h. 23m. 20.40s.		

	h. m. s.		h. m. s.
Mean longitude from 1st lunation.....	7 23 25.10	Mean longitude from 2d lunation.....	7 23 22.61
Mean longitude from 2d lunation.....	23.61		
Longitude of Station.....	7 23 24.45		

Date.	Results for longitude during two lunations.	Date.	Results for longitude during two lunations.
1855.	h. m. s.	1855.	h. m. s.
May 24	7 23 19.200	May 31	7 23 26.710
25	7 23 20.410	June 22	7 23 42.930
26	7 23 27.920	28	7 23 15.884
28	7 23 32.870	28	7 23 16.764
29	7 23 25.780	30	7 23 17.140
30	7 23 23.240	July 1	7 23 20.780

Longitude of Los Nogales by a mean of the above results, (the one adopted,) 7h. 23m. 24.136s.

TABLE II.

Tabulation of results for the latitude of astronomical station at Los Nogales derived from observations made with a zenith telescope (T. & S.) on twenty-nine pairs of stars: By J. H. Clark, Principal Assistant.

Date.	1st pair.	2d pair.	3d pair.	4th pair.	5th pair.	6th pair.	7th pair.	8th pair.	9th pair.	10th pair.	11th pair.	12th pair.
	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.
	* S. 3995	S. 3995	S. 4110	N. 4198	S. 4248	N. 4282	N. 4282	S. 4388	S. 4388	S. 4388	S. 4388	N. 4408
	† N. 4023	N. 4098	N. 4036	S. 4142	N. 4229	S. 4318	S. 4319	N. 4408	N. 4415	N. 4395	N. 4600	S. 4575
1855.	"	"	"	"	"	"	"	"	"	"	"	"
May 23	.....	.....	.....	.....	60.45	60.42	.....	63.78	63.33	.....	.....	.....
25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	58.62	60.30	64.96	58.75	60.98	60.76	60.85	63.33	64.87	63.39	65.18	59.92
30	58.59	59.34	64.61	.....	58.19	58.96	59.36	59.83	61.64	59.05	60.37	59.05
June 5	.....	.....	.....	.....	59.35	60.69	60.14	62.74	64.01	63.13	63.38	60.43
7	.....	.....	.....	.....	59.45	61.59	61.00	62.73	63.38	61.89	62.92	60.35
Mean of each pair..	58.60	59.82	64.78	58.75	59.53	60.48	60 33	62.98	63.44	61.61	62.96	59.93

TABLE II—Continued.

Date.	13th pair.	14th pair.	15th pair.	16th pair.	17th pair.	18th pair.	19th pair.	20th pair.	21st pair.	22d pair	23d pair.	24th pair.
	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.
	N. 4415	S. 4575	S. 4575	N. 4714	S. 4737	S. 4810	N. 4863	N. 4961	S. 5075	N. 5157	N. 5175	S. 5244
	S. 4575	N. 4595	N. 4600	S. 4723	N. 4741	N. 4943	S. 4893	S. 4991	N. 5131	S. 5189	S. 5234	N. 5259
1855.	"	"	"	"	"	"	"	"	"	"	"	"
May 23	.....	60.93	62.66	58.32	59.38	.....	59.95	61.21	61.04	56.67	.....	61.73
25	.....	56.44	57.70	59.07	57.85	.....	60.31	62.19	60.14	56.88	.....	62.63
26	.....	59.55	60.29	58.42	59.21	.....	60.58	62.05	59.01	55 63	.....	62.22
29	61.38	59.89	61.69	.....	.....	.....	.....	.....	.....	.....	.....	.....
30	60.86	58.78	59.61	60.67	56.66	60.34	.....	60.52	.....	.....	.....	.....
June 5	61.75	59.86	61.12	60.28	.....	.....	61.33	62.80	61.43	.....	59.49	61.83
7	61.00	59.51	60.54	59.91	59.38	.....	62.23	63.50	62.62	.....	59.89	62.14
Mean of each pair..	61.24	59.28	60.51	59.44	58.49	60.34	60.88	62.04	60.62	56.39	59.69	62.11

TABLE II—Continued.

Date.	25th pair.	26th pair.	27th pair.	28th pair.	29th pair.	Latitude by a mean of each night.	1st result.	2d result.	3d result.	Final result.
	B. A. C.	B. A. C.	B. A. C.	B. A. C.	B. A. C.		Latitude by a mean of each pair.	Lat. by a mean of all the observations.	Lat. by a mean of the results for each night.	Mean of 1st, 2d, and 3d results.
	S. 5284	S. 5367	S. 5368	S 5504	S. 5507					
	N. 5338	N. 5388	N. 5388	N. 5568	N. 5568					
1855.	"	"	"	"	"	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
May 23	60.64	59.54	58.97	58.27	59.74	31 20 60.33				
25	58.89	59.68	58.66	58.69	60.10	31 20 59.22				
26	60.75	59.86	59.63	.....	.....	31 20 59.78				
29	.....	.....	.....	.....	.....	31 20 61.61				
30	.....	.....	.....	.....	.....	31 20 59.79				
June 5	61.80	60.97	60.19	59.05	60.19	31 20 61.13				
7	60.38	61.22	60.45	.....	.....	31 20 61.33				
Mean of each pair.	60.83	60.25	59.62	58.64	60.01		31 20 60.45	31 20 60.55	31 20 60.45	31 20 60.48

*S., star south of the zenith. †N., star north of the zenith.

TABLE III.

Tabulation of results for the latitude of astronomical station at head of Santa Cruz river, derived from observations made with a zenith telescope (T. & S.) on twenty-three pairs of stars: By J. H. Clark, Principal Assistant, assisted by C. N. Turnbull, Lieut. Corps Top. Eng'rs, U. S. A.

Date.	1st pair. B. A. C. 3593 S. 3533 N.	2d pair. B. A. C. 3548 N. 3650 S.	3d pair. B. A. C. 3742 S. 3811 N.	4th pair. B. A. C. 3869 S. 3959 N.	5th pair. B. A. C. 3995 S. 4026 N.	6th pair. B. A. C. 3995 S. 4028 N.	7th pair. B. A. C. 4067 N. 4150 S.	8th pair. B. A. C. 4059 N. 4156 S.	9th pair. B. A. C. 4177 N. 4242 S.	10th pair. B. A. C. 4248 S. 4282 N.
1855.	′	″	″	″	″	″	″	″	″	″
May 10	58.28	.....	57.59	.....	.....	.....	.....	53.19	53.41	.....
11	.....	53.59	57.23	.....	55.72	56.57	53.99	53.16	54.84	56.55
12	.....	.....	.....	56.59	56.76	57.23	.....	.....	.....	.....
13	.....	.....	.....	56.09	55.75	57.07	51.81	51.18	55.64	.....
14	.....	.....	.....	.....	55.39	56.60	52.74	52.00	52.82	54.77
Mean of each pair.	58.28	53.59	57.41	56.50	55.90	56.86	52.51	52.38	54.19	55.66

TABLE III—Continued.

Date.	11th pair. B. A. C. 4289 N. 4318 S.	12th pair. B. A. C. 4345 N. 4388 S.	13th pair. B. A. C. 4345 N. 4575 S.	14th pair. B. A. C. 4346 N. 4388 S.	15th pair. B. A. C. 4346 N. 4575 S.	16th pair. B. A. C. 4388 S. 4408 N.	17th pair. B. A. C. 4388 S. 4415 N.	18th pair. B. A. C. 4388 S. 4595 N.	19th pair. B. A. C. 4388 S. 4600 N.	20th pair. B. A. C. 4408 N. 4575 S.
1855.	″	″	″	″	″	″	″	″	″	″
May 10	57.38	.....	.....	.....	.....	58.93	59.49	.....	.....	.....
11	56.47	56.69	56.37	59.38	57.73	57.96	57.00	56.42	56.77	55.58
12	.....	56.03	.....	56 56	.....	.....	.....	.....	.....	.....
13	55.50	57.59	55.35	58.53	56.32	61.20	60.72	56.90	58.54	57.86
14	57.31	55.96	54.99	56.81	55.73	58.08	58.47	57.95	59.37	57.06
Mean of each pair.	56.66	56.90	55.54	57.69	56.59	58.86	58.92	57.08	58.22	56.83

TABLE III—Continued.

Date.	21st pair. B. A. C. 4415 N. 4575 S.	22d pair. B. A. C. 4575 S. 4595 N.	23d pair. B. A. C. 4575 S. 4600 N.	Latitude by a mean of each night.	1st result. Latitude by a mean of each pair.	2d result. Latitude by a mean of all the observations.	3d result. Latitude by a mean of the results for each night.	Final result. Mean of 1st, 2d, and 3d results.
1855.	″	″	″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
May 10	.....	53.60	54.74	31 17 56.36				
11	55.26	54.77	55.09	31 17 56.03				
12	.....	.....	.....	31 17 56.62				
13	58.51	54.65	57.55	31 17 56.67				
14	57.46	56.94	58.90	31 17 56.24				
Mean of each pair.	57.07	54.99	56.39		31 17 56.30	31 17 56.32	31 17 56.38	31 17 56.33

TABLE IV.

Tabulation of results for the latitude of astronomical station at San Bernardino, derived from observations made with a zenith telescope (T. & S.) on twenty-one pairs of stars: By J. H. Clark, Principal Assistant, assisted by H. Campbell.

Date.	1st pair.	2d pair.	3d pair.	4th pair.	5th pair.	6th pair.	7th pair.	8th pair.	9th pair.
	B. A. C. 3397 S. 3364 N.	B. A. C. 3416 N. 3506 S.	B. A. C. 3523 S. 3533 N.	B. A. C. 3548 N. 3650 S.	B. A. C. 3560 N. 3650 S.	B. A. C. 3742 S. 3811 N.	B. A. C. 3842 S. 3856 N.	B. A. C. 3919 S. 3953 N.	B. A. C. 3953 N. 3992 S.
1855.	"	"	"	"	"	"	"	"	"
April 27	40.71	37.16	41.89	40.35	40 52	.....	.....	40.74	41.51
28	40 67	38.01	42.35	.....	.....	.....	.....	.....	.....
29	42.09	35.24	.....	42.03	40.27	43.05	41.85	41.18	36.99
30	38.31	35.52	40.79	.....	42.80	40.66	41.04	43.35	.....
May 2	.....	.....	.....	.....	.....	40.44	41.37	.....	.....
Mean of each pair	40.29	36.48	41.67	41.29	41.19	41.38	41.75	40.75	39.25

TABLE IV—Continued.

Date.	10th pair.	11th pair.	12th pair.	13th pair.	14th pair.	15th pair.	16th pair.	17th pair.	18th pair.
	B. A. C. 3995 S. 4026 N.	B. A. C. 3995 S. 4028 N.	B. A. C. 4059 N. 4156 S.	B. A. C. 4177 N. 4242 S.	B. A. C. 4248 S. 4262 N.	B. A. C. 4282 N. 4318 S.	B. A. C. 4282 N. 4319 S.	B. A. C. 4388 S. 4408 N.	B. A. C. 4388 S. 4415 N.
1855.	"	"	"	"	"	"	"	"	"
April 27	.....	.....	.....	.....	.....	.....	.....	.....	.....
28	.....	.....	.....	.....	.....	.....	.....	.....	.....
29	.....	.....	38.00	38.35	38.77	39.64	39.65	44.03	45.51
30	38.25	41.38	35.98	38.18	39.39	39.66	40.27	41.68	43.21
May 2	40.87	41.19	41.98	.....	40.23	38.18	38.73	41.07	43.45
Mean of each pair	39.56	41.25	38.65	38.26	39.46	39.16	39.55	42.26	44.05

TABLE IV—Continued.

Date.	19th pair.	20th pair.	21st pair.	Latitude by a mean of each night.	1st result.	2d result.	3d result.	Final result.
	B. A. C. 4479 N. 4513 S.	B. A. C. 4575 S. 4595 N.	B. A. C. 4575 S. 4600 N.		Latitude by a mean of each pair.	Latitude by a mean of all the observations.	Latitude by a mean of the results for each night.	Latitude by a mean of 1st, 2d, and 3d results.
1855.	"	"	'	° ' "	° ' "	° ' "	° ' "	° ' "
April 27	.....	.....	.....	31 19 40.45				
28	.....	.....	.....	31 19 40.14				
29	40.69	40.07	42.45	31 19 40.55				
30	40.84	39.77	41.50	31 19 39.97				
May 2	.....	.....	.....	31 19 40.74				
Mean of each pair	40.76	39.92	41.97		31 19 40.42	31 19 40.35	31 19 40.37	31 19 40.38

TABLE V.

Tabulation of results for the latitude of astronomical station at San Luis Springs, derived from observations made with a zenith telescope (T. & S.) on twenty-eight pairs of stars: By J. H. Clark, Principal Assistant, assisted by Lieut. Turnbull.

Date.	1st pair. B. A. C. 3170 S. 3290 N.	2d pair. B. A. C. 3170 S. 3297 N.	3d pair. B. A. C. 3204 S. 3290 N	4th pair. B. A. C. 3204 S. 3297 N.	5th pair. B. A. C. 3327 S. 3364 N.	6th pair. B. A. C. 3416 N. 3500 S.	7th pair. B. A. C. 3523 S. 3533 N.	8th pair. B. A. C. 2348 N. 3650 S.	9th pair. B. A. C. 3560 N. 3650 S.	10th pair. B. A. C. 3742 S. 3811 N.	11th pair. B. A. C. 3842 S. 3856 N.	12th pair. B. A. C. 3919 S. 3953 N.
1855.	"	"	"	"	"	"	"	"	"	"	"	"
April 17	32.90	33.05	32.45	33.21	31.53	28.12	31.40	29.95	32 72	32.64	32.62	30.19
18	33.16	34.18	32.58	33.61	30.95	27.82	32.54	29.34	31 88	31 91	34.00	30.73
19	31.59	33.99	32.19	34.29	31.43	28.02	31.93	28.74	31.15	33.57	32.12	32.34
20	.....	.....	.....	.....	32.11	29.05	33.90	32 39	33.57	33.14	32.84	31.15
21	33.12	.....	32.63	.....	30.59	29.09	32.98	28.37	30.63	32.09	34.17	30.97
Mean of each pair	32.51	33.71	32.46	33.70	31.32	28.42	32.55	29.75	31.99	32.67	33.15	31.06

TABLE V—Continued.

Date.	13th pair. B. A. C. 3953 N. 3992 S.	14th pair. B. A. C. 3995 S. 4026 N.	15th pair. B. A. C. 3995 S. 4028 N.	16th pair. B. A. C. 2984 S. 2984 N.	17th pair. B. A. C. 2984 N. 3000 S.	18th pair. B. A. C. 2984 N. 3002 S.	19th pair. B. A. C. 4059 N. 4156 S.	20th pair. B. A. C. 4248 S. 4282 N.	21st pair. B. A. C. 4282 N. 4318 S.	22d pair. B. A. C. 4282 N. 4319 S.	23d pair. B. A. C. 4345 N. 4388 S.	24th pair. B. A. C. 4346 N. 4388 S.
1855.	"	"	"	"	"	"	"	"	"	"	"	"
April 17	26.95	32.33	33.10	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	27.18	.....	.....	31.47	30.65	32.45	27.96	31 55	31.65	31.47	31.35	32.54
19	28.51	.....	.....	.....	26.80	30.56	27.08	32.31	33.38	33.23	.....	.....
20	27.14	.....	.....	.....	28.41	31.06	.....	31.45	32.96	33.75	.....	.....
21	27.63	.....	.....	.....	.....	.....	28.08	34.36	34.20	34.10	.....	.....
Mean of each pair	27.48	32.33	33.10	31.47	29.26	31.35	27.47	32.41	33.04	33.13	31.35	32.54

TABLE V—Continued.

Date.	25th pair. B. A. C. 4408 N. 4388 S.	26th pair. B. A. C. 4415 N. 4388 S.	27th pair. B. A. C. 3069 S. 3085 N.	28th pair. B. A. C. 4177 N. 4242 S.	Latitude by a mean of each night.	1st result. Latitude by a mean of each pair.	2d result. Latitude by a mean of all the observations.	3d result. Lat. by a mean of the results for each night.	Final result. Mean of 1st, 2d, and 3d results.
1855.	"	"	"	"	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
April 17	.....	.....	.....	.....	31 20 31.49				
18	33.12	34.61	.....	.....	31 20 32.00				
19	33.36	33.39	27.62	29.71	31 20 31.27				
20	32.90	34.18	29.28	27.54	31 20 31.43				
21	32.55	33.99	....	29.03	31 20 31.58				
Mean of each pair	32.98	34.04	28.45	28.76		31 20 31.51	31 20 31.48	31 20 31.55	31 20 31.51

TABLE VI.

Tabulation of results for the latitude of astronomical station at Agua del Perro, derived from observations made with a zenith telescope (T. & S.) on twenty-five pairs of stars: By J. H. Clark, Principal Assistant, assisted by H. Campbell.

Date.	1st pair. G. C. 638 S. 675 N.	2d pair. G. C. 638 S. 677 N.	3d pair. G. C. 638 S. 678 N.	4th pair. B. A. C. 2493 S. 2504 N.	5th pair. B. A. C. 2540 S. 2592 N.	6th pair. B. A. C. 2984 N. 3000 S.	7th pair. B. A. C. 2695 S. 2715 N.	8th pair. B. A. C. 2894 S. 2984 N.	9th pair. B. A. C. 2984 N. 3002 S.	10th pair. B. A. C. 3002 S. 3085 N.	11th pair. B. A. C. 3170 S. 3290 N.
1855.	″	″	″	″	″	″	″	″	″	″	″
April 4								56.03	58.70	58.35	57.34
5	57.24	57.12	59.89		60.89	56.73		57.08	58.86	57.71	59.42
6				57.22	56.69	54.38		56.98	55.94	56.27	57.39
7				55.44	60 14	55.57	57.67	57.50	57.26	55.94	60.61
8							57.78	57.69		55.94	57.08
Mean of each pair	57.24	57.12	59.89	56 33	59.19	55.56	57.72	57.05	57.69	56.84	58.36

TABLE VI—Continued.

Date.	12th pair. B. A. C. 3170 S. 3297 N.	13th pair. B. A. C. 3204 S. 3290 N.	14th pair. B. A. C. 3204 S. 3297 N.	15th pair. B. A. C. 3337 S. 3354 N.	16th pair. B. A. C. 3416 N. 3500 S.	17th pair. B. A. C. 3523 S. 3533 N.	18th pair. B. A. C. 3548 N. 3630 S.	19th pair. B. A. C. 3560 N. 3650 S.	20th pair. B. A. C. 3742 S. 3811 N.	21st pair. B. A. C. 3842 S. 3856 N.	22d pair. B. A. C. 3919 S. 3953 N.
1855.	″	″	″	″	″	″	″	″	″	″	″
April 4	58.36	56.73		56.98	54.84	60.49	55.94	58.48			
5	60.22		60.35	56.17	55.98	58.73	55.63	58.12	57.43	60.94	55.80
6	58.58	57.54	58.74	57.44			56.35	58.29		59.82	56.14
7		58.42	59.50	56.80	56.42	57.98	55.95		58.55	60.65	
8		59.39		57.06	53.63	58.61	54.57	57.38	56.90	58.64	55.76
Mean of each pair	58.91	58.02	59.53	56.75	55.21	58.77	55.68	58.06	57.62	59.83	55.90

TABLE VI—Continued.

Date.	23d pair. B. A. C. 3953 N. 3992 S.	24th pair. B. A. C. 3995 S. 4036 N.	25th pair. B. A. C. 3995 S. 4038 N.	Latitude by a mean of each night.	1st result. Latitude by a mean of each pair.	2d result. Latitude by a mean of all the observations.	3d result. Lat. by a mean of the results for each night.	Final result. Mean of 1st, 2d, and 3d results.
1855.	″	″	″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
April 4				31 20 57.41				
5	55.27			31 20 57.44				
6		58.77	59.85	31 20 57.43				
7	58.76	57.44	58.97	31 20 57.63				
8				31 20 57.08				
Mean of each pair	57.01	58.10	59.41		31 20 57.67	31 20 57.58	31 20 57.43	31 20 57.56

TABLE VII.

Tabulation of results for the latitude of astronomical station at Espia, derived from observations made with a zenith telescope (T. & S.) on twenty-three pairs of stars: By J. H. Clark, Principal Assistant, assisted by Lieut. Turnbull.

Date.	1st pair. G. C. 638 S. 675 N.	2d pair. G. C. 638 S. 677 N.	3d pair. G. C. 638 S. 678 N.	4th pair. B. A. C. 2540 S. 2592 N.	5th pair. B. A. C. 2605 S. 2715 N.	6th pair. B. A. C. 2894 S. 2984 N.	7th pair. B. A. C. 2984 N. 3000 S.	8th pair. B. A. C. 3002 S. 2984 N.	9th pair. B. A. C. 3062 S. 3085 N.	10th pair. B. A. C. 3170 S. 3200 N.
1855.	"	"	"	"	"	"	"	"	"	"
March 24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
25	53.39	.....	53.36	.....	56.77	57.15	.....	57.25	53.70	.....
26	54.74	55.01	56.47	.....	54.84	56.53	55.05	55.09	54.33	.....
27	54.11	53.68	55.39	.....	54.77	57.94	55.80	57.53	56.84	.....
29	55.97	56.16	57.67	57.36	.....	58.15	55.75	57.01	55.64	57.17
31	.....	.....	.....	.....	.....	56.92	55.38	56.68	55.17	.....
Mean of each pair...	54.55	54.95	55.72	57.36	55.46	57.33	55.49	56.71	55.13	57.17

TABLE VII—Continued.

Date.	11th pair. B. A. C. 3170 S. 3297 N.	12th pair. B. A. C. 3204 S. 3290 N.	13th pair. B. A. C. 3204 S. 3297 N.	14th pair. B. A. C. 3327 S. 3364 N.	15th pair. B. A. C. 3416 N. 3500 S.	16th pair. B. A. C. 3503 S. 3533 N.	17th pair. B. A. C. 3610 N. 3666 S.	18th pair. B. A. C. 3742 S. 3811 N.	19th pair. B. A. C. 3842 S. 3856 N.	20th pair. B. A. C. 3919 S. 3953 N.
1855.	"	"	"	"	"	"	"	"	"	"
March 24	.....	.....	.....	.....	.....	.....	58.35	56.10	.....	57.59
25	.....	56.32	57.64	57.68	54.91	56.32	58.92	57.68	57.94	56.33
26	.....	56.21	57.02	56.19	54.51	58.89	57.42	57.15	.....	57.98
27	.....	57.49	.....	55.81	54.87	58.21	58.21	57.78	.....	.....
29	58.67	56.85	58.35	57.68	56.19	55.86	59.09	57.58	59.03	56.31
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean of each pair...	58.67	56.71	57.53	56.64	55.12	57.32	58.39	57.25	58.48	56.87

TABLE VII—Continued.

Date.	21st pair. B. A. C. 3992 S. 3953 N.	22d pair. B. A. C. 3995 S. 4026 N.	23d pair. B. A. C. 3995 S. 4026 N.	Latitude by a mean of each night.	1st result. Latitude by a mean of each pair.	2d result. Latitude by a mean of all the observations.	3d result. Latitude by a mean of the results for each night.	Final result. Latitude by a mean of 1st, 2d, and 3d results.
1855.	"	"	"	° ′ ″	° ′ ″	° ′ ″	° ′ ″	′ ″
March 24	54.98	.....	.....	31 20 56.58				
25	53.96	56.70	58.03	31 20 56.14				
26	53.97	57.14	58.94	31 20 56.23				
27	.....	.....	.....	31 20 56.31				
29	53.78	56.33	57.69	31 20 56.95				
31	.....	.....	.....	31 20 56.13				
Mean of each pair...	53.67	56.69	58.22		31 20 56.56	31 20 56.43	31 20 56.37	31 20 56.45

TABLE VIII.

Tabulation of results for the latitude of astronomical station at Carrizalillo, derived from observations made with a zenith telescope (T. & S.) on fourteen pairs of stars: By J. H. Clark, Principal Assistant, assisted by H. Campbell.

Date.	1st pair. G. C. 389 N. 400 S.	2d pair. G. C. 414 N. 400 S.	3d pair. G. C. 419 N. 400 S.	4th pair. G. C. 461 N. 505 S.	5th pair. G. C. 570 N. 556 S.	6th pair. G. C. 586 N. 589 S.	7th pair. G. C. 653 N. 689 S.	8th pair. G. C. 747 N. 714 S.	9th pair. G. C. 747 N. 715 S.	10th pair. G. C. 797 N. 792 S.	11th pair. G. C. 892 N. 863 S.
1855.	"	"	"	"	"	"	"	"	"	"	"
Feb'y 24	.....	.....	.....	.....	55.09	.....	.....	.....	56.72	52.15	54.78
25	.....	55.11	55.95	.....	.....	.....	.....	.....	.....	54.10	52.26
26	55.64	52.00	54.29	.....	.....	.....	.....	.....	.....	54.84	54.10
27	54.41	53.77	55.87	.....	57.73	53.50	.....	.....	.....	54.59	53.41
March 2	.....	.....	.....	.....	54.71	55.06	57.89	.....	55.41	56.59	.....
3	.....	.....	.....	56.99	54.64	55.29	56.75	.....	57.71	55.39	.....
5	.....	.....	.....	56.09	53.07	54.00	54.83	.....	54.83	52.50	52.52
6	.....	.....	.....	.....	54.41	.....	57.26	56.92	57.16	54.64	53.86
7	.....	.....	.....	56.70	53.62	55.95	56.80	.....	58.27	54.47	54.74
8	.....	.....	.....	57.87	54.86	54.43	.....	.....	.....	53.87	54.12
12	.....	.....	.....	.....	54.84	55.23	56.03	55.83	55.48	56.39	.....
Mean of each pair	55.02	53.62	55.37	56.91	54.77	54.78	56.59	56.32	56.51	54.50	53.72

TABLE VIII—Continued.

Date.	12th pair. G. C. 869 N. 871 S.	13th pair. G. C. 880 N. 939 S.	14th pair. 797 N., G. C. 2995 S., B. A. C.	Latitude by a mean of each night.	1st result. Latitude by a mean of each pair.	2d result. Latitude by a mean of all the observations.	3d result. Lat. by a mean of the results for each night.	Final result. Latitude by a mean of 1st, 2d, and 3d results.
1855.	"	"	"	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
Feb'y 24	55.91	.....	.....	31 50 54.93				
25	54.71	.....	.....	31 50 54.42				
26	54.78	.....	.....	31 50 54.61				
27	56.62	.....	.....	31 50 54.98				
March 2	.....	.....	.....	31 50 55.93				
3	.....	.....	.....	31 50 56.13				
5	54.57	54.26	.....	31 50 54.07				
6	56.55	.....	.....	31 50 55.81				
7	55.41	.....	.....	31 50 55.74				
8	55.38	.....	.....	31 50 55.09				
12	.....	.....	55.94	31 50 55.67				
Mean of each pair	55.74	54.26	55.94		31 50 55.29	31 50 55.19	31 50 55.21	31 50 55.23

TABLE IX.

Results for longitude of Carrizalillo, east of terminal point of parallel 31° 47′ *north latitude.*
Observer, J. H. Clark: Computer, H. Campbell.

Date.	Authority for elements used.	Results for longitude from moon's 1st limb.	Date.	Authority for elements used.	Results for longitude from moon's 2d limb.
1855.		h. m. s.	1855.		h. m. s.
Feb. 23	N. A.	7 11 36.138	March 3	N. A.	7 11 56.145
24	-------	46.304	4	-------	51.290
25	-------	47.792	7	-------	41.910
26	-------	35.111			
27	-------	43.990			
March 1	-------	41.259			
2	-------	42.667			
Mean longitude from moon's 1st limb		h. m. s. 7 11 41.894	Mean longitude from moon's 2d limb		h. m. s. 7 11 49.781
			Mean longitude from moon'st 1st limb		41.894
Mean longitude		7h 11m. 45.84s.			

Date.	Results for longitude from moon's 1st and 2d limbs.	Remarks.
	h. m. s.	
Feb. 23	7 11 36.138	
24	46.304	
25	47.792	
26	35.111	
27	43.990	
March 1	41.259	
2	42.667	
3	56.145	
4	51.290	
7	41.910	
Mean longitude adopted	7h. 11m. 44.26s.	

TABLE X.

Tabulation of results for the latitude of astronomical station at the Initial Point on the Rio Grande, derived from observations made with zenith telescope, (T. & S.,) on twenty-two pairs of stars: By J. H. Clark, principal assistant, assisted by H. Campbell.

Date.	1st pair. G. C. 18 N. 170 S.	2d pair. G. C. 18 N. 251 S.	3d pair. G. C. 135 N. 188 S.	4th pair. G. C. 170 S. 277 N.	5th pair. G. C. 194 N. 244 S.	6th pair. G. C. 203 N. 244 S.	7th pair. G. C. 204 S. 267 N.	8th pair. G. C. 230 S. 267 N.	9th pair. G. C. 244. S. 252 N.	10th pair. G. C. 251 S. 277 N.
1854.	"	"	"	"	"	"	"	"	"	"
Dec'r 27	.....	.....	51.20	.....	.....	49.17	.....	.....	48.04	.....
28	.....	.....	52.07	.....	.....	50.21	.....	.....	49.85	.....
29	.....	.....	49.75	.....	.....	51.60	.....	.....	50.30	.....
1855.										
Jan'y 1	.....	.....	51.78	.....	.....	52.07	.....	.....	50.87	.....
2	50.06	49.46	.....	50.43	.....	.....	.....	.....	.....	50.10
3	.....	.....	50.70	.....	.....	51.89	.....	.....	51.44	.....
6	.....	.....	51.49	.....	.....	51.58	.....	.....	50.31	.....
9	.....	.....	50.78	.....	.....	53.00	.....	.....	.....	.....
11	.....	.....	.....	.....	.....	.....	50.67	52.02	.....	.....
13	.....	.....	.....	.....	50.99	50.77	.....	.....	50.63	.....
14	.....	.....	.....	.....	52.28	50.74	.....	.....	50.88	.....
15	.....	.....	.....	.....	53.79	53.09	.....	.....	52.42	.....
Mean of each pair...	50.06	49.46	51.09	50.43	52.35	51.41	50.67	52.02	50.52	50.10

TABLE X—Continued.

Date.	11th pair. G. C. 267 N. 271 S.	12th pair. G. C. 311 N. 345 S.	13th pair. G. C. 370 S. 389 N.	14th pair. G. C. 389 N. 400 S.	15th pair. G. C. 400 S. 414 N.	16th pair. G. C. 400 S. 419 N.	17th pair. G. C. 430 N. 448 S.	18th pair. G. C. 461 N. 505 S.	19th pair. G. C. 556 S. 570 N.	20th pair. G. C. 586 N. 589 S.
1854.	"	"	"	"	"	"	"	"	"	"
Dec'r 27	50.73	51.56	52.28	.....	51.25	53.40	51.10	52.54	52.04	51.89
28	51.69	51.97	50.21	.....	51.92	.....	53.65	.....	50.55	51.77
29	.....	50.84	49.10	.....	50.04	53.05	52.21	.....	.....	.....
1855.										
Jan'y 1	50.91	.....	52.35	.....	52.39	.....	53.16	.....	.....	.....
2	.....	51.82	51.17	.....	51.25	.....	51.76	.....	51.88	50.68
3	.....	.....	50.30	.....	51.33	.....	50.77	.....	52.11	50.87
6	51.58	52.23	51.84	.....	48.86	.....	50.80	.....	51.44	50.19
9	50.61	52.30	51.40	.....	50.29	.....	.....	.....	.....	.....
11	50.67	52.51	.....	53.13	52.16	53.92	53.29	.....	.....	.....
13	50.42	.....	51.07	.....	51.23	52.86	50.56	.....	.....	.....
14	51.32	49.88	.....	.....	50.64	51.85	50.67	.....	.....	.....
15	52.11	53.88	50.19	.....	51.25	53.16	49.95	.....	.....	.....
Mean of each pair...	51.11	51.85	50.99	53.13	51.05	53.04	51.62	52.54	51.60	51.08

TABLE X—Continued.

Date.	21st pair. G. C. 653 N. 661 S.	22d pair. G. C. 652 N. 661 S.	Latitude by a mean of each night.	1st result. Latitude by a mean of each pair.	2d result. Latitude by a mean of all the observations.	3d result. Latitude by a mean of the results for each night.	Final result. Mean of 1st, 2d, and 3d results.
1854.	"	"	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
Dec'r 27	50.71	.....	31 46 51.22				
28	.....	.....	31 46 51.39				
29	.....	.....	31 46 50.86				
1855.							
Jan'y 1	.....	.....	31 46 51.93				
2	.....	50.01	31 46 50.78				
3	49.50	.....	31 46 50.99				
6	.....	51.85	31 46 51.19				
9	.....	.....	31 46 51.39				
11	.....	.....	31 46 52.99				
13	.....	.....	31 46 51.06				
14	.....	.....	31 46 51.13				
15	.....	.....	31 46 52.17				
Mean of each pair...	50.10	50.93		31 46 51.23	31 46 51.30	31 46 51.35	31 46 50.29

9.—*Azimuths for laying off the prime vertical of stations from* 1 *to* 8, *inclusive.*

Measurements for establishing the prime vertical at the initial point of parallel 31° 47′.

JANUARY 7, 1855.

Reading of azimuth circle instrument in true meridian, previously determined by transit observations.				Reading of azimuth circle instrument in prime vertical.			
Ver. A.	B.	C.	D.	A.	B.	C.	D.
° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
90 00 00	180 00 05	270 00 07	.....	180 00 00	270 00 15	359 59 55	89 59 40
89 59 55	180 00 00	269 59 55	359 59 45	180 00 05	270 00 15	360 00 10	90 00 00
89 59 55	180 00 00	270 00 05	360 00 05	.....	.....	.....	.....
89 59 56.6	180 00 01.6	270 00 02.3	359 59 55	180 00 02.5	270 00 15	360 00 02.5	89 59 50

Observations for the determination of the true meridian at San Luis Springs.

APRIL 20, 1855.

Time of observation by chronometer 2419, sidereal.	Reading of azimuth circle, telescope directed on star. Ver. 1.	2.	3.	4.	Reading of azimuth circle when plane of instrument stands in true meridian. Ver. 1.	2.	3.	4.	Computed azimuth of Polaris west of north at each observation.	Remarks.
h. m. s.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	
11 42 18	181 29 15	271 29 10	1 29 15	91 29 15	179 58 23.9	269 58 19.4	359 58 19.4	89 58 20.9	1 30 54.1	Chronometer 2419 is fast 2h. 42m. 0.57s.
11 54 14.7	181 26 30	271 26 25	1 26 15	91 26 25	179 58 14.7	269 58 09.7	359 58 00	89 58 09.9	1 28 15.3	The reading of azimuth circle when telescope was directed on signal = zero.
19 05 09.9	181 24 10	271 24 10	1 24 00	91 24 05	179 58 28.9	269 58 28.9	359 58 19	89 58 24	1 25 41.1	Error of signal from true meridian west of north = 1′ 41″.8.
					179 58 22.5	269 58 19.3	359 58 12.8	89 58 18.2		

	′	″
Ver. No. 1	1	37.5
2	1	40.7
3	1	47.2
4	1	41.8
Mean	1	41.8

9.—*Azimuths for laying off the prime vertical, &c.*—Continued.

Observations for the determination of the true meridian at San Luis Springs.

APRIL 22, 1855..

Time by chronometer 2419, sidereal.	Reading of azimuth circle, telescope directed on star.				Reading of azimuth circle, telescope directed on signal.				Reading of azimuth circle when plane of inst. stands in true meridian.				Computed azimuth of Polaris west of N. at each observation.	Results
	Ver. 1.	2.	3.	4.	Ver. 1.	2.	3.	4.	Ver. 1.	2.	3.	4.		
h. m. s.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	′ ″
11 51 26.6	91 27 20	181 27 10	271 27 20	1 27 30	90 00 15	180 00 00	270 00 10	0 00 25	89 58 24.8	179 58 14.8	269 58 24.8	0 58 34.8	1 28 55.20	1 47.70
12 11 55.7	91 22 30	181 22 10	271 22 25	1 22 35	90 00 20	180 00 05	270 00 35	0 00 55	89 58 36.1	179 58 16.1	269 58 31.1	0 58 41.1	1 23 53.9	1 58.67
12 31 05.7	91 17 40	181 17 25	271 17 35	1 17 50	.....	.....	.....	.....	89 59 05.1	179 58 50.1	269 59 00.1	0 59 15	1 18 34.9	57.42
12 41 20.6	91 14 40	181 14 25	271 14 40	1 14 50	90 01 00	180 00 45	270 01 05	0 01 20	89 59 10	179 58 55	269 59 10	0 59 20	1 15 30	1 57.50
					90 00 35	180 00 16.6	270 00 36.6	0 00 53.3	89 58 49.0	179 58 34.0	269 58 46.5	0 58 57.72	.....	1 40.39

	′ ″
Error of signal from true meridian West of North.....	1 40.39
Result April 20.....	1 41.80
Error of signal by a mean of two nights' observations.....	1 41.06

Observations for the determination of the true meridian at San Bernardino.

APRIL 28, 1855.

Time of observation by chronometer 2419, sidereal.	Reading of azimuth circle, telescope directed on star.				Reading of azimuth circle, telescope directed on signal.				Mean difference of readings at each observation.	Azimuth of Polaris at each observation deduced from east elongation.	Error of signal from true meridian by each observation.
	Ver. 1	2	3	4	Ver. 1	2	3	4			
h. m. s.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	′ ″
21 51 01.4	89 59 50	179 59 35	269 59 40	0 00 45	91 11 40	181 11 35	271 11 45	1 12 05	1 11 48.75	1 42 52.46	30 63.71
22 01 07.9	89 59 35	179 59 40	269 59 45	0 00 15	91 11 30	181 11 27.5	271 11 40	1 12 00	1 11 50.6	1 42 40.76	30 50.16
22 08 06.9	89 59 50	179 59 45	270 00 02	0 00 20	91 11 30	181 11 27.5	271 11 40	1 12 00	1 11 40	1 42 25.68	30 45.68
22 13 51.6	90 00 05	179 59 40	270 00 07.5	0 00 25	91 11 30	181 11 27.5	271 11 40	1 12 00	1 11 35	1 42 08.96	30 33.96

Error of signal from true meridian E. of N. = 30′ 48″.37.

APRIL 29, 1855.

Time of observation by chronometer 2419, sidereal.	Reading of azimuth circle, telescope directed on star.				Reading of azimuth circle, telescope directed on signal.				Mean difference of readings at each observation.	Azimuth of Polaris at each observation deduced from east elongation.	Error of signal from true meridian by each observation.
	Ver. 1	2	3	4	Ver. 1	2	3	4			
h. m. s.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	′ ″
21 54 47.1	359 59 15	89 59 10	179 59 20	269 59 35	1 11 45	91 11 32.5	181 11 42	271 11 50	1 12 22.37	1 42 49.57	30 27.20
22 01 37	359 59 20	89 59 10	179 59 15	269 59 35	1 11 45	91 11 32.5	181 11 42	271 11 50	1 12 22.34	1 42 40.00	30 17.66
22 20 02.9	0 00 22	90 00 02.5	180 00 22.5	270 00 32.5	1 11 35	91 11 15	181 11 40	271 11 45	1 11 13.87	1 41 46.83	30 32.96

Error of signal from true meridian E. of N. = 30′ 25″.04.

9.—*Azimuths for laying off the prime vertical, &c.*—Continued.

Observations for the determination of the true meridian at San Bernardino—Continued.

APRIL 30, 1855.

Time of observation by chronometer 2419, sidereal.	Reading of azimuth circle, telescope directed on star.				Reading of azimuth circle, telescope directed on signal.				Mean difference of readings at each observation.	Azimuth of Polaris at each observation deduced from east elongation.	Error of signal from true meridian by each observation.
	Ver. 1	2	3	4	Ver. 1	2	3	4			
h. m. s.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	′ ″
21 35 38.5	358 47 55	88 48 00	178 47 45	268 47 40	359 59 45	89 59 50	179 59 40	269 59 20	1 11 48.75	1 42 47.33	30 58.58
21 49 08.6	358 47 45	88 47 40	178 47 45	268 47 30	359 59 45	89 59 50	179 59 35	269 59 25	1 11 58.75	1 42 53.35	30 51.60
22 09 35.8	358 47 45	88 47 55	178 47 40	268 47 35	359 59 42	89 59 40	179 59 25	269 59 20	1 11 48.12	1 42 29.04	30 33.92

	′ ″
Error of signal from true meridian	30 49.03
April 29, signal from true meridian	30 25.94
April 28, signal from true meridian	30 48.37
Mean error of signal from true meridian E. of N.	30 41.11

Observations for the determination of the true meridian at camp near the head of the Santa Cruz river.

MAY 10, 1855.

Time of observation by chronometer 2419, sidereal.	Reading of azimuth circle, telescope directed on star.				Reading of azimuth circle, telescope directed on signal.				Mean difference of readings at each observation.	Azimuth of Polaris at each observation deduced from east elongation.	Error of signal from true meridian by each observation.
	Ver. 1	2	3	4	Ver. 1	2	3	4			
h. m. s.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
21 41 51.8	170 03 15	260 03 20	350 03 22.5	80 03 30	179 59 45	269 59 45	359 59 50	89 59 55	9 56 26.87	1 42 52.09	8 13 34.78
21 55 39.9	170 03 15	260 03 10	350 03 15	80 03 20	179 59 45	269 59 30	359 59 50	89 59 50	9 56 28.70	1 42 54.67	8 13 34.03
22 10 37.8	170 03 15	260 03 10	350 03 17	80 03 25	179 59 45	269 59 35	359 59 50	89 59 55	9 56 29.50	1 42 35.48	8 13 54.50

Error of signal on true meridian West of North, 8° 13′ 41″.10.

Observations at the intersection of the parallel 31° 20′ *and the* 111*th*° *of longitude west from Greenwich for the determination of the true meridian.*

JUNE 14, 1855.

Time of observation by chronometer 2419, sidereal.	Reading of azimuth circle, telescope directed on star.			Reading of azimuth circle, telescope directed on signal.			Mean difference of readings at each observation.	Azimuth of Polaris at each observation deduced from east elongation.	Error of signal from true meridian by each observation.	Remarks.
	Ver. 1	2	3	Ver. 1	2	3				
h. m. s.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	
21 43 13.5	190 18 45	0 18 45	940 19 10	117 59 00	257 59 15	237 58 45	2 19 50	1 42 52.4	36 57 46	Chronometer 2419 fast 2h. 54m. 20s.
21 51 34.5	190 19 30	0 19 30	940 19 15	117 59 15	257 59 15	237 59 30	2 20 05	1 43 01.7	37 03 26	

Azimuth of signal by a mean of two observations on Polaris East of North, 37′ 00″.38.

9.—*Azimuths for laying off the prime vertical, &c.*—Continued.

Observations at the intersection of the parallel 31° 20′ *and the* 111th° *of longitude west from Greenwich, &c.*—Continued.

JUNE 15, 1855.

Time of observation by chronometer 2419, sidereal.	Reading of azimuth circle, telescope directed on star.		Reading of azimuth circle, telescope directed on signal.		Mean difference of readings at each observation.	Azimuth of Polaris at each observation deduced from east elongation.	Error of signal from true meridian by each observation.	Remarks.
	Ver. 1	2	Ver. 1	2				
h. m. s.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	′ ″	
21 22 10.5	312 10 50	132 10 55	309 52 15	129 52 20	2 18 35	1 41 50.7	36 49.30	Chronometer 2419 fast 2h. 54m. 25s.
21 27 23.5	312 11 15	132 11 05	309 52 15	120 52 20	2 18 52	1 42 12.35	36 39.65	Azimuth of signal by a mean of ten observation
21 44 22.5	312 11 45	132 12 10	309 52 10	129 52 30	2 19 37.5	1 42 54.27	36 43.24	on Polaris East of North, 36′ 55″.59.
21 50 58	312 12 10	132 12 05	309 52 10	129 52 30	2 19 57.5	1 43 01.29	36 55.21	
21 55 48	312 12 15	132 12 20	309 52 10	129 52 30	2 19 57.5	1 43 03.24	36 54 26	
21 58 47	312 12 40	132 12 20	309 52 10	129 52 25	2 20 15	1 43 03.07	37 11.93	
22 06 46	312 12 00	132 12 20	309 52 10	129 52 25	2 19 52.5	1 42 57.41	36 54.04	
22 10 38	312 11 35	132 12 10	309 52 10	129 52 25	2 19 45	1 42 52.65	36 52.95	
22 19 08.5	312 12 00	132 12 15	309 52 10	129 52 25	2 19 50	1 42 34.03	37 15.97	
22 25 07	312 11 30	132 11 45	309 52 00	129 52.30	2 19 22.5	1 42 16.13	37 06.37	

	′ ″
Result June 14th	37 06.36
Result June 15th	36 59.59
Azimuth of signal by a mean of two nights' observations on Polaris	36 57.97

10.—*Elements for marking parallels of latitude* 31° 20′ *and* 31° 47′.

PARALLEL 31° 20′.

Distances from point of beginning (on tangent.)		Length of offset from tangent (= difference of latitude.)		Latitude of points on tangent.	Azimuth of tangent at several points bearing North East.	Longitude of points *five miles* apart on the parallel of 31° 20′.
Miles.	Feet.	In arc.	In feet.			
		″		° ′ ″	° ′ ″	° ′ ″
0	0	0.000	0.000	31 20 00.00	90 00 00.0	0 00 00.00
1	0	0.004	0.4	00.00	89 59 43.3	1 00.88
5	0	0.100	10.1	19 59.90	57 21.7	5 04.43
10	0	0.401	40.5	59.60	54 43.4	10 08.86
15	0	0.902	91.1	59.10	52 05.0	15 13.24
20	0.8	1.604	162.0	58.40	49 26 8	20 16.75
25	1.2	2.506	253.2	57.50	46 48.5	25 22.06
30	1 7	3.609	364.6	56.39	44 10.2	30 26.48
35	2.6	4.913	496.4	55.09	41 32.0	35 30.89
40	4.3	6.417	648.4	53.58	38 53.7	40 35.33
45	6.0	8.121	820.5	51.88	36 15.9	45 39.70
50	7.7	10.026	1013.0	49.97	33 37.9	50 44.13
55	10.3	12.131	1225.7	47.87	30 58.9	55 48.54
60	13.6	14.437	1458.7	45.56	28 21.6	1 00 52.96
64						
+979 ft.	16.6	16.622	1869.8	43.48	26 06.2	1 06 07.69
100	62.4	40.115	4050.2	19.89	07 15.0	1 41 26.26

10.—*Elements for marking parallels, &c.*—Continued.

PARALLEL 31° 47′.

Distance, in miles, from the point of beginning.	Length of offset (= difference of latitude.)		Latitude at the end of any distance on the tangent.	Azimuth of the tangent at any distance bearing North East.	Longitude of the point of the parallel determined by each offset.
	In arc.	In feet.			
	″		° ′ ″	° ′ ″	′ ″
1	0.004	0.4	31 47 00.00	89 59 43.0	1 01.17
5	0.102	10.3	46 59.90	57 18.9	5 05.88
10	0.408	41.2	59.59	54 37.8	10 12.75
15	0.918	92.7	59.08	51 56.7	15 17.63
20	1.632	164.9	58.37	49 15.5	20 23.50
25	2.550	257.6	57.45	46 34.5	25 29.37
30	3.673	371.1	56.33	43 53.0	30 25.24
35	5.000	505.2	55.00	41 12.2	35 41.11
40	6.530	659.8	53.47	38 31.2	40 46.97
45	8.265	835.0	51.74	35 50.0	45 52.83
50	10.203	1030.9	49.80	33 09.0	50 58.68
55	12.346	1247.4	47.65	30 08.0	56 04.53
60	14.692	1484.4	45.31	27 47.0	61 10.37

Log. N in feet..... = 7.3210987
Log. $(1 + e^2 \cos.{}^2 L)$ ..... = 0.0021096
Log. 2 sin 1″..... = 4.9666049
Log. sin 1″..... = 4.6855749

1° of parallel..... = 104,069.2 yds.
10′ of parallel..... = 17,344.87 "
1′ of parallel..... = 1,734.487 "
1″ of parallel..... = 28.908 "
1″ of parallel..... = 86.724 feet.

$$L - l = D^2 \frac{\text{tang. } L\,(1 + e^2 \cos L)}{N^2\, 2 \sin 1''}$$

$$Z = 90° - D \text{ tang. } l \frac{1}{N \sin 1''}$$

$$\text{Diff. long.} = D \frac{1}{N \sin 1''} \frac{1}{\cos l}$$

D = distance in feet, measured on tangent.
L = lat. of points of beginning of ditto.
l = lat. of any point of tangent.
Z = azimuth of tangent line at any point.

Log. $(L - l)$ = log. (D^2) + 0.1579269
Log. 2 sin 1″ = 4.9666049
Log. sin 1″ = 4.6855749

MEMORANDA.

One hundred miles of parallel of 31° 47′	=	° ′ 1 41 57.55
Longitude of initial point of parallel on Rio Bravo, (by survey from Frontera.)		106 31 26.50
Longitude of terminal point of parallel 31° 47′		108 13 24.05
Longitude of terminal point of parallel 31° 20′, (by treaty)	=	111 00 00.00
		° ′ ″
Length of parallel 31° 20′—in arc	=	2 46 35.95
Do do in yards		288964.03
Do do in feet		866892.10
Do do in miles and feet	=	164 miles + 972 feet.
One degree of parallel of latitue 31° 47′	=	103,570.85 yards.
One minute of do do		1,726.18 "
One second of do do		28.77 "
Or in feet	=	86.310
One degree of parallel of latitude 31° 20′	=	104,069.2 yards.
One minute of do do		1,734.487 "
One second of do do		28.908 "
Or in feet	=	86.724
From parallel 31° 20′ to 31° 47′ = 27′	=	31 miles + 5.37 feet.
One degree of meridian (middle latitude being 31° 33½)	=	121,248.43 yards.
One minute of do do		2,020.807 "
One second of do do do		33.680 "
Or in feet	=	101.04

ASTRONOMICAL POSITIONS

ALONG

THE RIO BRAVO DEL NORTE.

D.—BOUNDARY LINE FORMED BY THE RIO BRAVO DEL NORTE.

OFFICE OF SURVEY OF THE UNITED STATES AND MEXICAN BOUNDARY,
Washington, D. C., May 22, 1856.

SIR: In my communication of February 9, 1856, I presented to you the final results for the longitudes of the astronomical station, established under your direction in the year 1853, near the mouth of Rio Bravo del Norte, the same having been computed with corresponding observations made at Greenwich, Philadelphia High School, and Radcliffe observatories.

I have now to present, in a tabular form, the individual results of all the observations made by you and under your orders for the longitudes and latitudes of the primary astronomical positions on and near the Rio Bravo del Norte, established in connexion with the survey of the United States and Mexican boundary.

I.—LONGITUDES.

The positions thus determined are eight in number, being enumerated as follows in the order of place from the west:

a. Frontera.
a[1]. San Elceario.
b. El Paso del Norte.
c. Mouth of Cañon.
d. Presidio del Norte.
e. Fort Duncan, Texas.
f. Ringgold Barracks.
g. Mouth of Rio Bravo del Norte.

All the observations made at these places, together with the computations, as well as the elements and data used therein, are *herewith* presented in a tabular form, comprising the corresponding observations made at Greenwich, Cambridge, Philadelphia High School, and Radcliffe observatories.*

Attached to this is also a recapitulation of the results, from which are deduced the final longitude adopted for each station, the papers being marked *a*, *a*[1], *b*, *c*, *d*, *e*, *f*, *g*, to each of which I will briefly call your attention.

a. *Frontera.*—The observations at this place extend through four lunations, commencing December 29, 1851, and ending April 6, 1852; making, as combined in table (I,) the longitude=7[h] 6[m] 13[s].02 west of Greenwich.

* These computations are to be deposited in the Department of the Interior, in manuscript form.

a[1]. *San Elcearío.*—Moon culminations were observed at this place simultaneous with those observed at Frontera. These observations extend through a period of five lunations, commencing January 29, and ending June 3, 1852; making, as combined in table (II,) the longitude of San Elcearío=7^h 5^m 4^s.43 west of the meridian of Greenwich.

This result, however, as well as that above given for Frontera, has been corrected by combining with them the difference of longitude of these places, as determined by flashes of gunpowder simultaneously observed at Frontera, El Paso del Norte, and San Elcearío, on the nights of February 14, 18, 19, and March 14, 1852, (see table III,) by which it appears that San Elcearío is east of Frontera=1^m 7^s.30, whilst that deduced from moon culminations, 1^m 8^s.59; difference,=1^s.29.

The longitudes of Frontera and San Elcearío, as determined from moon culminations, being corrected by half the difference $\frac{1^s.29}{2}$, gives for the final adopted longitude of Frontera 7^h 6^m 12^s.37; San Elcearío, 7^h 5^m 5^s.07.

b. *El Paso del Norte* being, as determined by flashes, 15^s.94 east of Frontera, it is therefore in longitude=7^h 5^m 56^s.43 west of the meridian of Greenwich.

c. The astronomical station "near the *mouth of the Cañon*," on the left bank of Rio Bravo del Norte, is in longitude=7^h 2^m 29^s.06; having been determined, in the absence of moon culminations, by thirteen flashes of gunpowder, simultaneously observed at that station and San Elcearío, on the night of June 21, 1852, to be 2^m 36^s.0 east of San Elcearío.—(See table IV.)

d. The astronomical station near *Presidio del Norte*, on the left bank of Rio Bravo del Norte, was determined by a series of moon culminations, observed during a period of two lunations, commencing July 26, 1852, and ending August 29, 1852, determining its position to be 6^h 57^m 39^s.02 west of the meridian of Greenwich.—(See table V.)

e. The astronomical station near *Fort Duncan*, Texas, was determined to be in longitude 6^h 42^m 1^s.78 west of the meridian of Greenwich, from observed moon culminations, commencing October 19, and ending October 27, 1852, combined as per table herewith marked VI.

f. *Ringgold Barracks* is in longitude 6^h 35^m 6^s.19, as determined by moon culminations observed on ten nights during the months of June and July, 1853, the several results being combined as per table herewith, marked VII.

g. The longitude of the astronomical station near the *mouth of the Rio Bravo del Norte* has already been discussed by me, as presented to you in report of February 19, 1856, (herewith appended, marked *g*,) to which I refer you for the conclusion of the subject of the longitudes of the primary points on the Rio Bravo; it explains in detail the manner in which all the observations and computations have been tabulated, for which reason I have not herein before made reference thereto.

II. Latitudes.

The two volumes herewith* (marked *Latitudes*,) contain, in a tabulated form, all the individual observations made by yourself with the zenith instrument, for determining the latitudes of all the primary astronomical stations on and near the Rio Bravo del Norte, from Frontera down to its mouth, with the exception of San Elcearío and Fort Duncan; of these two, the former was determined in 1851, by Lieutenant Whipple, topographical engineers, by transits of stars over the prime vertical, and the latter in 1852, by Lieutenant Michler, topographical engineers, by circum-meridian altitudes of N. and S. stars observed with a sextant.

* To be deposited in the Department of the Interior.

The tables appended present a recapitulation of all the results for the latitudes of the primary stations, giving results which have been adopted, as follows, viz:

a. Frontera, by a mean of 106 observations made by W. H. Emory, on twenty-four pairs of stars observed near the zenith, is determined by combining the results, as in table herewith, marked VIII, to be in latitude = 31° 48′ 44″.53.

The table marked IX, indicates the corrections derived from actual observations of the stars at the Washington Observatory, which corrections have been applied as indicated in table IX*a*.

*b. San Elceario** was determined by Lieutenant Whipple in 1851, by twenty prime vertical observations on eight stars, to be in latitude 31° 35′ 12″.62, the individual results being combined as shown in table X.

c. Astronomical station near the *mouth of Cañon* is in latitude 31° 2′ 26″.15, as determined by Major Emory in 1852, from fifty observations on twenty-one pairs of stars near the zenith; the individual results being combined as shown in table marked XI. Table XI*a*, shows the corrections which have been applied as indicated in table XI, in order to introduce the stars' elements as given in the "Twelve-Year Catalogue."

d. Astronomical station near *Presidio del Norte* is in latitude 29° 34′ 7″.13, as determined by Major W. H. Emory in 1852, from 121 observations on twenty-six pairs of stars near the zenith, combined as shown in table marked XII. Table XII*a*, shows the corrections which have been applied as indicated in table XII, in order to introduce the stars' positions as given in the "Twelve-Year Catalogue."

e. Fort Duncan (Eagle Pass) is in latitude 28° 42′ 43″.67, as determined by Lieutenant N. Michler, topographical engineers, in 1852, from eighty-seven altitudes of north and south stars, observed with a sextant, combined as in table marked XIII.

f. Ringgold Barracks (observatory) is in latitude 26° 22′ 27″.79, as determined by Major Emory in 1853, from 107 observations on thirty-two pairs of stars near the zenith, combined as shown in table marked XIV. Table XIV*a*, shows the corrections which have been applied as indicated in table XIV, in order to give to the stars their positions furnished in the "Twelve-Year Catalogue."

g. The astronomical station near the *mouth of Rio Bravo del Norte* is in latitude 25° 57′ 21″.83, as determined by Major W. H. Emory in 1853, from 129 observations on twenty pairs of stars near the zenith, combined as shown in table marked XV.

The papers herewith have been arranged in this manner with a view to facilitate you in preparing them for such further use as you may deem best.

Very respectfully, your obedient servant,

GEO. THOM,

Captain Topographical Engineers.

Major Wm. H. Emory, *United States Commissioner.*

* This place was subsequently determined by myself, not knowing that Lieutenant Whipple had observed there; but finding he had done so, I gave his observations priority.—W. H. E.

TABLE I.

Tabulation of results for longitude of astronomical station at Frontera observatory, derived from observations made with the bronzed transit and sidereal chronometer No. 2440, (by Parkinson & Frodsham:) By Major Wm. H. Emory, Chief Astronomer and Surveyor United States and Mexican boundary survey.*

Date.	Moon's first limb.	Date.	Moon's sec'd limb.
1851.	h. m. s.	1852.	h. m. s.
Dec. 29	7 06 05.1	Jan. 7	7 06 08.7
30	08.2	8	22.0
31	13.1	9	15.4
1852.		10	06.4
Jan. 1	09.0		21.2
3	13.2		
Mean.....	h. m. s. =7 06 08.66	Mean—2d limb...	h. m. s. =7 06 14.74
		Mean—1st limb...	= 08.66
Mean longitude from first lunation.....			h. m. s. =7 06 11.70

Date.	Moon's first limb.	Date.	Moon's sec'd limb.
1852.	h. m. s.	1852.	h. m. s.
Jan. 29	7 06 16.6	Feb. 4	7 06 10.2
30	11.2	5	06.3
Feb. 1	17.7	7	14.2
2	19.6	9	13.6
4	09.1	10	07.7
		11	17.1
Mean.....	h. m. s. =7 06 14.96	Mean—2d limb...	h. m. s. =7 06 11.52
		Mean—1st limb...	= 14.96
Mean longitude from second lunation.....			h. m. s. =7 06 13.24

Date.	Moon's first limb.	Date.	Moon's sec'd limb.
1852.	h. m. s.	1852.	h. m. s.
Feb. 28	7 06 06.0	Mar. 4	7 06 20.0
29	08.1	5	13.8
Mar. 1	17.8	6	09.6
2	14.1	8	14.8
3	13.3		
4	19.7		
5	17.4		
Mean.....	h. m. s. =7 06 13.77	Mean—2d limb...	h. m. s. =7 06 14.55
		Mean—1st limb...	= 13.77
Mean longitude from third lunation.....			h. m. s. =7 06 14.16

Date.	Moon's first limb.	Date.	Moon's sec'd limb.
1852.	h. m. s.	1852.	h. m. s.
Mar. 31	7 06 08.6	April 4	7 06 13.9
April 1	05.6	5	13.9
2	16.1	6	19.8
Mean.....	h. m. s. =7 06 10.1	Mean—2d limb...	h. m. s. =7 06 15.87
		Mean—1st limb...	= 10.10
Mean longitude from fourth lunation.....			h. m. s. =7 06 12.98

Lunation.	Longitude deduced.
	h. m. s.
First.....	7 06 11.70
Second.....	7 06 13.24
Third.....	7 06 14.16
Fourth.....	7 06 12.98
* Longitude of Frontera.....	h. m. s. =7 06 13.02

* Reduced from Greenwich observations for 1851-'52.

TABLE II.

Tabulation of results for longitude of astronomical station at San Elceario, Texas, derived from observations made with transit (by Troughton & Simms) and mean solar chronometer No. 76, (by Charles Young:) By Lieut. William F. Smith, topographical engineers, and by J. Lawson, under the direction of Major W. H. Emory, chief astronomer and surveyor of the United States and Mexican boundary survey.

Date.	Authority for elements used.	Moon's 1st limb.	Resulting longitude from observations on moon's 1st l'b.	Date.	Authority for elements used.	Moon's 2d limb.	Resulting longitude from observations on moon's 2d l'b.
1852.		h. m. s.	h. m. s.			h. m. s.	h. m. s.
Jan. 29	Greenwich Right Ascensions	7 05 06.07		Feb. 8	Greenwich Right Ascensions.	.....	7 05 04.4
	Cambridge observations.....	7 05 05.77	7 05 05.96	9	Greenwich Right Ascensions.	.....	7 05 02.1
	Cambridge Right Ascensions.	7 05 06.04		11	Greenwich Right Ascensions.	.....	7 05 01.9
30	Greenwich Right Ascensions	7 04 59.80		12	Greenwich Right Ascensions.	.....	7 05 06.9
	Greenwich observations.....	7 04 59.09	7 04 59.45				
31	Greenwich Right Ascensions.	.....	7 05 01.30				
Feb. 1	Greenwich Right Ascensions.	7 04 58.70					
	Greenwich observations.....	7 04 59.70	7 04 59.20				
2	Greenwich Right Ascensions.	.....	7 05 03.50				
4	Greenwich Right Ascensions.	.....	7 05 01.80				

Mean longitude from moon's 1st limb = 7h. 05m. 01s.87

Mean longitude from moon's 2d limb = 7h. 05m. 03s.83
Mean longitude from moon's 1st limb = 7h. 05m. 01s.87

Mean longitude from 1st lunation = 7h. 05m. 02s.85.

Date.	Authority for elements used.	Moon's 1st limb.	Resulting longitude from observations on moon's 1st l'b.	Date.	Authority for elements used.	Moon's 2d limb.	Resulting longitude from observations on moon's 2d l'b.
1852.		h. m. s.	h. m. s.	1852.		h. m. s.	h. m. s.
Feb. 28	Greenwich Right Ascensions.	.....	7 05 02.7	March 5	Greenwich Right Ascensions.	7 05 06.8	
29	Greenwich Right Ascensions.	7 05 03.6			Greenwich observations.....	7 05 08.5	7 05 07.65
	Greenwich observations. ...	7 05 02.4	7 05 03.0	7	Greenwich Right Ascensions.	.....	7 05 09.8
March 1	Greenwich Right Ascensions.	7 05 06.6					
	Washingt'n Right Ascensions	7 05 04.2	7 05 05.4				
2	Greenwich Right Ascensions.	7 05 08.4					
	Greenwich observations.....	7 05 08.9					
	Washingt'n Right Ascensions	7 05 07.1	7 05 07.22				
	Cambridge Right Ascensions.	7 05 03.3					
	Cambridge observations.....	7 05 08.4					
4	Greenwich Right Ascensions.	.....	7 05 04.3				
5	Greenwich Right Ascensions.	7 05 05.6					
	Greenwich observations.....	7 05 05.2	7 05 05.4				

Mean longitude from moon's 1st limb = 7h. 05m. 04s.67

Mean longitude from moon's 2d limb = 7h. 05m. 08s.73
Mean longitude from moon's 1st limb = 7h. 05m. 04s.67

Mean longitude from 2d lunation = 7h. 05m. 06s.70.

TABLE II—Continued.

Date.	Authority for elements used.	Moon's 1st limb.	Resulting longitude from observations on moon's 1st l'b.	Date.	Authority for elements used.	Moon's 2d limb.	Resulting longitude from observations on moon's 2d l'b.
1852.		h. m. s.	h. m. s.	1852.		h. m. s.	h. m. s.
March 29	Greenwich Right Ascensions.		7 05 02.1	April 4	Greenwich Right Ascensions.		7 05 07.9
30	Greenwich Right Ascensions.		7 05 11.5	5	Greenwich Right Ascensions.		7 05 01.5
April 1	Greenwich Right Ascensions.	7 05 05.8		6	Greenwich Right Ascensions.		7 05 01.5
	Greenwich observations.	7 05 07.6	7 05 07.63				
	Cambridge Right Ascensions.	7 05 10.4					
	Cambridge observations.	7 05 06.7					
3	Greenwich Right Ascensions.	7 05 05.6	7 05 07.75				
	Greenwich observations.	7 05 09.9					

Mean longitude from moon's 1st limb = 7h. 05m. 07s.24.

Mean longitude from moon's 2d limb = 7h. 05m. 03s.80.
Mean longitude from moon's 1st limb = 7h. 05m. 07s.24.

Mean longitude from third lunation = 7h. 05m. 05s.27.

Date.	Authority for elements used.	Moon's 1st limb.	Resulting longitude from observations on moon's 1st l'b.	Date.	Authority for elements used.	Moon's 1st limb.	Resulting longitude from observations on moon's 1st l'b.
1852.		h. m. s.	h. m. s.	1852.		h. m. s.	h. m. s.
April 29	Greenwich Right Ascensions.	7 05 00.5		April 30	Cambridge Right Ascensions.	7 05 02.8	7 05 03.05
	Cambridge Right Ascensions.	7 05 05.7	7 05 02.73		Cambridge observations.	7 05 03.3	
	Cambridge observations.	7 05 02.0					

Mean longitude from moon's 1st limb = 7h. 05m. 02s.89.

Date.	Authority for elements used.	Moon's 1st limb.	Resulting longitude from observations on moon's 1st l'b.	Date.	Authority for elements used.	Moons 2d limb.	Resulting longitude from observations on moon's 2d l'b.
1852.		h. m. s.	h. m. s.	1852.		h. m. s.	h. m. s.
May 28	Greenwich Right Ascensions.	7 05 03.3		June 3	Greenwich Right Ascensions.		7 05 01.4
	Cambridge Right Ascensions.	7 05 02.9	7 05 02.63				
	Cambridge observations.	7 05 01.7					
29	Greenwich Right Ascensions.		7 05 10.20				
31	Greenwich Right Ascensions.	7 05 00.6					
	Greenwich observations.	7 05 01.6	7 05 01.10				
June 1	Greenwich Right Ascensions.		7 05 02.30				

Mean long. from moon's 1st limb = 7h. 05m. 04s.06
Mean long. from moon's 1st limb, by preceding lunation = 7h. 05m. 02s.89

Mean long. from moon's 2d limb = 7h. 05m. 01s.40
Mean of last two lunations from moon's first limb = 7h. 05m. 03s.48

Mean longitude from fourth and fifth lunations = 7h. 05m. 02s.44.

	h. m. s.
Longitude of San Elcearic from first lunation	= 7 05 02.85
Do do from second lunation	= 7 05 06.70
Do do from third lunation	= 7 05 05.27
Do do from fourth and fifth lunations	= 7 05 02.44

Longitude of San Elcearic = 7h. 05m. 04s.43.

TABLE III.

Difference of longitude between Frontera and San Elcearío, by flashes of gunpowder, made on the 14th February, 1852.

No. of flash.	Name of station.	Name of chronometer.	Time of flash by chronometer.	Chronometer, fast or slow, of mean solar or sidereal time.	Mean solar time of flash at each station.	Difference of longitude.
			h. m. s.		h. m. s.	m. s.
1	Frontera	P. & F. 2440 sidereal	5 07 39.8	Sidereal chronometer 2440 fast of sidereal time at Frontera, derived from its error on the 10th and 18th: m. s. 27 52.06 2 35.60	7 02 40.36	1 07.94
	San Elcearío	C. Y. 76 solar	7 01 12.0		7 03 47.60	
2	Frontera	2440 sidereal	5 09 31.0		7 04 38.24	*1 06.26
	San Elcearío	76 solar	7 03 09.9		7 05 44.50	
3	Frontera	2440 sidereal	5 11 46.5		7 06 53.37	1 07.63
	San Elcearío	76 solar	7 05 25.4		7 08 01.00	
4	Frontera	2440 sidereal	5 13 30.5		7 08 37.09	1 06.91
	San Elcearío	76 solar	7 07 08.4		7 09 44.00	
5	Frontera	2440 sidereal	5 15 31.3		7 10 37.56	1 07.94
	San Elcearío	76 solar	7 09 09.2		7 11 44.80	
6	Frontera	2440 sidereal	5 20 31.3		7 15 36.74	1 07.06
	San Elcearío	76 solar	7 14 08.2		7 16 43.80	
7	Frontera	2440 sidereal	5 22 32.0		7 17 36.87	1 07.43
	San Elcearío	76 solar	7 16 08.7		7 18 44.30	
8	Frontera	2440 sidereal	5 24 34.3		7 19 39.07	1 07.13
	San Elcearío	76 solar	7 18 10.6		7 20 46.20	
9	Frontera	2440 sidereal	5 26 32.8		7 21 37.25	1 07.05
	San Elcearío	76 solar	7 20 08.7		7 22 44.30	
10	Frontera	2440 sidereal	5 28 32.3		7 23 36.42	1 06.92
	San Elcearío	76 solar	7 22 07.8		7 24 43.40	
11	Frontera	2440 sidereal	5 33 34.8		7 28 38.10	1 07.30
	San Elcearío	76 solar	7 27 09.8		7 29 45.40	
12	Frontera	2440 sidereal	5 35 32.8	Mean solar chronometer 76 slow of mean time at San Elcearío	7 30 35.77	1 06.99
	San Elcearío	76 solar	7 29 07.16		7 31 42.76	
13	Frontera	2440 sidereal	5 37 33.8		7 32 36.45	1 07.07
	San Elcearío	76 solar	7 31 07.92		7 33 43.52	
14	Frontera	2440 sidereal	5 39 34.6		7 34 36.92	1 07.08
	San Elcearío	76 solar	7 33 08.4		7 35 44.00	
15	Frontera	2440 sidereal	5 41 47.3		7 36 49.25	*1 06.75
	San Elcearío	76 solar	7 35 20.4		7 37 56.00	

* Reject.

Difference of longitude deduced from 13 flashes of gunpowder, February 14..... m. s. 1 07.15

TABLE III—Continued.

Difference of longitude between Frontera and San Elceario, by flashes of gunpowder, made on the 18th February, 1852.

No. of flash.	Name of station.	Name of chronometer.	Time of flash by chronometer.	Chronomete, fast or slow, of mean solar or sidereal time.	Mean solar time of flash at each station.	Difference of longitude.
			h. m. s.		h. m. s.	m. s.
1	Frontera	P. & F. 9440 sidereal	5 25 02.6		7 04 06.33	
	San Elceario	C. Y. 76 solar	7 02 40.80	s. d. 29 09.46	7 05 13.50	1 07.17
			7 02 40.2 *d*	28 33.00		
2	Frontera	9440 sidereal	5 27 02.5		7 06 05.90	
	San Elceario	76 solar	7 04 40.4		7 07 13.67	1 07.77
			L. 40.8			
			C. 40.8			
3	Frontera	9440 sidereal	5 29 27.0		7 08 30.17	
	San Elceario	76 solar	7 07 04.6		7 09 37.70	1 07.53
			7 07 00.8 *d*			
4	Frontera	9440 sidereal	5 31 03.5		7 10 06.41	
	San Elceario	76 solar	7 08 41.2		7 11 14.99	1 07.7
			7 08 41.2			
5	Frontera	9440 sidereal	5 33 04.8		7 12 07.38	
	San Elceario	76 solar	7 10 41.9		7 13 14.83	1 07.45
			7 10 41.9			
			7 10 41.7			
6	Frontera	9440 sidereal	5 38 04.9		7 17 06.66	
	San Elceario	76 solar	7 15 41.2		7 18 41.20	1 07.54
			7 15 41.2			
			7 15 41.2			
7	Frontera	9440 sidereal	5 40 05.5		7 19 06.93	
	San Elceario	76 solar	7 17 41.2		7 20 14.20	1 07.27
			7 17 41.2			
			7 17 41.2			
8	Frontera	9440 sidereal	5 42 05.6		7 21 06.55	
	San Elceario	76 solar	7 19 41.16		7 22 14.15	1 07.60
			7 19 41.2			
			7 19 41.1			
9	Frontera	9440 sidereal	5 44 05.8		7 23 06.42	
	San Elceario	76 solar	7 21 41.2		7 24 14.20	1 07.78
			7 21 41.2			
			7 21 41.2			
10	Frontera	9440 sidereal	5 46 06.8		7 25 07.09	
	San Elceario	76 solar	7 23 41.5		7 26 14.47	1 07.38
			7 23 41.5			
			7 23 41.4			
11	Frontera	9440 sidereal	5 51 07.3		7 30 06.76	
	San Elceario	76 solar	7 28 41.2		7 31 14.20	1 07.44
			7 28 41.2			
			7 28 41.2			
12	Frontera	9440 sidereal	5 53 07.5		7 32 06.63	
	San Elceario	76 solar	7 30 41.2		7 33 14.20	1 07.57
			7 30 41.2			
			7 30 41.2			
13	Frontera	9440 sidereal	5 55 07.8		7 34 06.60	
	San Elceario	76 solar	7 32 41.1		7 35 14.10	1 07.50
			7 32 41.1			
			7 32 41.1			
14	Frontera	9440 sidereal	5 57 08.3		7 36 06.77	
	San Elceario	76 solar	7 34 41.4		7 37 14.40	1 07.63
			7 34 41.4			
			7 34 41.4			
5	Frontera	9440 sidereal	5 59 08.4		7 38 06.55	
	an Elceario	solar	7 36 41.2		7 39 14.20	1 07.65
			7 36 41.2			
			7 36 41.2			

Sidereal chronometer 9440 is fast sidereal time at Frontera.

Mean solar chronometer 76 slow of mean time at San Elceario.

Mean difference of longitude by 15 flashes of gunpowder, February 18..... 1m. 07.54s.

TABLE III—Continued.

Difference of longitude between Frontera and San Elceario, by flashes of gunpowder, made on the 19th of February, 1852.

No. of flash.	Name of station.	Name of chronometer.	Time of flash by chronometer.	Chronometer, fast or slow, of mean solar or sidereal time.	Mean solar time of flash at each station.	Difference of longitude.
			h. m. s.		h. m. s.	m. s.
1	Frontera	P. & F. 2440 sidereal	5 28 06.3		7 03 08.67	
	San Elceario	C. Y. 76 solar	7 01 41.34	s. 14.43	7 04 13.66	1 04.99
2	Frontera	2440 sidereal	5 30 08.3	m. 28	7 05 10.33	
	San Elceario	76 solar	7 03 45.6	9 39.6	7 06 17.96	1 07.63
			7 03 43.6d			
3	Frontera	2440 sidereal	5 32 09.4		7 07 11.10	
	San Elceario	76 solar	7 05 46.0		7 08 18.39	1 07.29
			7 05 46.0			
			7 05 46.1			
4	Frontera	2440 sidereal	5 34 09.2		7 09 10.68	
	San Elceario	76 solar	7 07 45.5		7 10 17.95	1 07.27
			7 07 45.6			
			7 07 45.6			
5	Frontera	2440 sidereal	5 36 09.8		7 11 10.95	
	San Elceario	76 solar	7 09 46.0		7 12 18.36	1 07.41
			7 09 46.0			
			7 09 46.0			
6	Frontera	2440 sidereal	5 41 10.8		7 16 11.12	
	San Elceario	76 solar	7 14 46.3		7 17 18.66	1 07.54
			7 14 46.3			
			7 14 46.3			
7	Frontera	2440 sidereal	5 43 10.6		7 18 10.70	
	San Elceario	76 solar	7 16 45.6		7 19 18.06	1 07.36
			7 16 45.6			
			7 16 45.8			
8	Frontera	2440 sidereal	5 45 10.8		7 20 10.57	
	San Elceario	76 solar	7 18 45.6		7 21 17.99	1 07.42
			7 18 45.6			
			7 18 45.7			
9	Frontera	2440 sidereal	5 47 12.5		7 22 11.94	
	San Elceario	76 solar	7 20 46.72		7 23 19.16	1 07.22
			7 20 46.8			
			7 20 46.8			
10	Frontera	2440 sidereal	5 49 11.8		7 24 10.91	
	San Elceario	76 solar	7 22 46.0		7 25 18.36	1 07.45
			7 22 46.0			
			7 22 46.0			
11	Frontera	2440 sidereal	5 54 51.3		7 29 49.29	
	San Elceario	76 solar	7 28 24.0		7 30 56.36	1 07.07
12	Frontera	2440 sidereal	5 56 12.8		7 31 10.56	
	San Elceario	76 solar	7 29 45.6		7 32 17.96	1 07.40
			7 29 45.6			
			7 29 45.6			
13	Frontera	2440 sidereal	5 58 14.6		7 33 12.03	
	San Elceario	76 solar	7 31 47.2		7 34 19.57	1 07.54
			7 31 47.2			
			7 31 47.2			
14	Frontera	2440 sidereal	6 00 13.3		7 35 10.41	
	San Elceario	76 solar	7 33 45.4		7 36 17.79	1 07.38
			7 33 45.5			
			7 33 45.4			
15	Frontera	2440 sidereal	6 02 14.3		7 37 11.08	
	San Elceario	76 solar	6 35 47.7*		7 38 18.21	1 07.13
			6 35 45.9			
			6 35 45.8			

Sidereal chronometer 2440 is fast of sidereal time at Frontera

Solar chronometer 76 is slow of mean time at San Elceario

* Rejected.

Mean difference of longitude by 15 flashes of gunpowder, February 19, 1m. 07s.36.

TABLE III—Continued.

Difference of longitude between Frontera and San Elceario, by flashes of gunpowder, made on the 14th March, 1852.

No. of flash.	Name of station.	Name of chronometer.	Time of flash by chronometer.	Chronometer, fast or slow, of mean solar or sidereal time.	Mean solar time of flash at each station.	Difference of longitude.
			h. m. s.		h. m. s.	m. s.
1	Frontera	P. & F. 9440 sidereal	7 01 06.8		6 59 41.57	
	San Elceario	C. Y. 76 solar	L. 6 58 36.0		7 00 49.01	1 07.44
			C. 6 58 35.8			
2	Frontera	9440 sidereal	7 03 07.4		7 01 41.84	
	San Elceario	76 solar	L. 7 00 36.0		7 02 49.11	1 07.27
			C. 7 00 36.0			
3	Frontera	9440 sidereal	7 05 07.5		7 03 41.62	
	San Elceario	76 solar	L. 7 02 35.6		7 04 48.71	1 07.09
			C. 7 02 35.6			
4	Frontera	9440 sidereal	7 07 08.2		7 05 41.99	
	San Elceario	76 solar	L. 7 04 36.0		7 06 49.11	1 07.12
			C. 7 04 36.0			
5	Frontera	9440 sidereal	7 09 08.5		7 07 41.96	
	San Elceario	76 solar	L. 7 06 35.5		7 08 48.61	1 06.65
			C. 7 06 35.5			
6	Frontera	9440 sidereal	7 14 08.8		7 12 41.56	
	San Elceario	76 solar	L. 7 11 35.6		7 13 48.76	1 07.20
			C. 7 11 35.7			
7	Frontera	9440 sidereal	7 16 09.5		7 14 41.94	
	San Elceario	76 solar	L. 7 13 36.0		7 15 49.06	1 07.12
			C. 7 13 35.9			
8	era	9440 sidereal	7 18 09.5		7 16 41.61	
	San Eleearia	76 solar	L. (Lost.)		7 17 48.71	1 07.10
			C. 7 15 35.6			
9	Frontera	9440 sidereal	7 20 09.6		7 18 41.37	
	San Elceario	76 solar	7 17 35.6		7 19 48.66	1 07.29
			7 17 35.5			
10	Frontera	9440 sidereal	7 22 10.3		7 20 41.74	
	San Elceario	76 solar	L. 7 19 36.0		7 21 49.11	1 07.37
			C. 7 19 36.0			
11	Frontera	9440 sidereal	(Lost.)		(Lost.)	
	San Elceario	76 solar	L. 7 24 36.0		7 26 49.11	
			C. 7 24 36.0			
12	Frontera	9440 sidereal	7 29 11.2		7 27 41.38	
	San Elceario	76 solar	L. 7 26 35.2		7 28 48.31	1 06.93
			7 26 35.2			
13	Frontera	9440 sidereal	7 31 11.6		7 29 41.45	
	San Elceario	76 solar	L. 7 28 35.8		7 30 48.71	1 07.26
			C. 7 28 35.8			
14	Frontera	9440 sidereal	7 33 12.3		7 31 41.82	
	San Elceario	76 solar	L. 7 30 35.8		7 32 48.91	1 07.09
			C. 7 30 35.8			
15	Frontera	9440 sidereal	7 35 13.4		7 33 42.59	
	San Elceario	76 solar	L. 7 32 36.7		7 34 49.86	1 07.27
			C. 7 32 36.8			

Sidereal chronometer 9440 fast of sidereal time at Frontera 20 05.23

Mean solar chronometer 76 slow of mean time at San Elceario 2 13.11

Mean of 14 observations, March 14, 1852 ..... = 1m. 07.15s.

The record of the flashes, to establish the difference of longitude between Frontera and San Elcearío, is given as a means of determining the weight to be attached to this mode of observing. Assuming the result to be correct, it gives a very satisfactory coincidence between the results obtained for longitude at Frontera and San Elcearío, by moon culminations, by two independent positions, with different instruments and different observers.

The record is omitted for other stations, but the results are given in the following table:

TABLE IV.

Recapitulation of differences of longitude of several astronomical stations on the Rio Bravo, found by flashes of gunpowder.

Date.	No. of flashes.	Difference of long. between Frontera & El Paso.	No. of flashes.	Difference of long. between Frontera & San Elcearío.	Difference of long. between El Paso & San Elcearío.	No. of flashes.	Difference of long. between San Elcearío and mouth of Cañon.
1852.		s.		m. s.	s.		m. s.
Feb. 14	14	16.03	13	1 07.16	51.13		
18	15	16.06	15	1 07.54	51.48		
19	12	15.84	15	1 07.36	51.52		
Mar. 14	12	15.84	14	1 07.15	51.31		
June 21	..	.....	..	.....	.....	13	9 36.01

TABLE V.

Long. of station near Presidio del Norte, computed from observations with transit, by W. H. Emory.

With tabular R. A. in Nautical Almanac.			With Greenwich observed R. A.		
1852.		h. m. s.	1852.		h. m. s.
July 26	Observations on moon's 1st limb.....	= 6 57 18.17	July 26	Observations on moon's 1st limb.....	= 6 57 37.53
27	.....do.....do.....	= 27.32	27	.....do.....do.....	= 47.67
28	.....do.....do.....	= 37.41	28	.....do.....do.....	= 55.76
29	.....do.....do.....	= 17.00	29	.....do.....do.....	= 34.50
Aug. 24	.....do.....do.....	= 24.76	Aug. 24	.....do.....do.....	= 44.76
25	.....do.....do.....	= 17.56	25	.....do.....do.....	= 39.02
27	.....do.....do.....	= 06.04	27	.....do.....do.....	= 41.33
28	.....do.....do.....	= 03.41	28	.....do.....do.....	= 20.30
	Sum.....	= 8)151.67		Sum.....	= 8)320.89
	Mean.....	= 6 57 18.96		Mean.....	= 6 57 40.11
July 30	Observations on moon's 2d limb.....	= 6 57 22.62	July 30	Observations on moon's 2d limb.....	= 6 57 39.66
31	.....do.....do.....	= 11.67	31	.....do.....do.....	= 28.78
Aug. 1	.....do.....do.....	= 35.48	Aug. 1	.....do.....do.....	= 43.97
2	.....do.....do.....	= 06.73	2	.....do.....do.....	= 39.89
3	.....do.....do.....	= 25.13	3	.....do.....do.....	= 40.42
4	.....do.....d	= 36.06	4	.....do.....do.....	= 47.36
29	.....do.....do.....	= 08.70	29	.....do.....do.....	= 33.10
	Sum.....	= 7)146.59		Sum.....	= 7)353.50
	Moon's 2d limb—mean.....	= 6 57 20.94		Moon's 2d limb—mean.....	= 6 57 37.93
	Moon's 1st limb—mean.....	= 6 57 18.96		Moon's 1st limb—mean.....	= 6 57 40.11
	Sum.....	= 39.90		Sum.....	= 78.04
	Mean.....	= 6 57 19 95		Mean.....	= 6 57 39.02
	Correction to be applied for tabular error.	= +11.26			
	Long. of station near Presidio del Norte, computed with elements from N. A....	= 6 57 31.21		Long. of station near Presidio del Norte	= 6 57 39.02

TABLE V—Continued.

Comparison of results for longitude of station near Presidio del Norte, for each date of observation, as computed with Tab. R. A. in Nautical Almanac and Greenwich observations.

Date of observation.	Long. computed with N. Almanac R. A.	Long. computed with Greenwich observations.	Greenwich observations + N. Almanac, or difference.
1852.	h. m. s.	h. m. s.	s.
July 26.....	6 57 18.17	6 57 37 53	+ 19.36
27.....	27.32	47.67	20.35
28.....	37.41	55.76	18.35
29.....	17.00	34.50	17.50
30.....	22.82	39.66	16.84
31.....	11.67	28.78	17.11
Aug. 1.....	35.48	43.27	7.79
2.....	06.73	32.89	26.16
3.....	25.13	40.42	15.29
4.....	36.06	47.38	11.32
24.....	24.76	44.76	20.00
25.....	17.56	39.02	21.46
27.....	06.04	41.35	35.31
28.....	03.41	20.30	16.89
29.....	6 57 08.70	6 57 33.10	+ 24.40
	Sum.....		= 15)288.13
	Mean.....		= + 19s.21

Comparison of mean results for longitude, obtained from observations on moon's limbs, as computed with Tab. R. A. in Nautical Almanac and Greenwich observations.

	h. m. s.
FIRST.	
Mean of results of observations on moon's first limb, computed from Tabular Right Ascensions in Nautical Almanac.....	6 57 18.96
Mean of results of observations on moon's first limb, computed from Greenwich observations.....	6 57 40.11
Difference, or Greenwich observations + Nautical Almanac.....	= + 21.15
SECOND.	
Mean of results of observations on moon's second limb, computed from Tabular Right Ascensions in Nautical Almanac.....	6 57 20.94
Mean of results of observations on moon's second limb, computed from Greenwich observations.....	6 57 37.93
Difference, or Greenwich observations + Nautical Almanac.....	= + 16.99

Corrections to be applied to results obtained from computations (with tabular R. A. in Nautical Almanac) of observations made near Presidio del Norte.

	h. m. s.
Observed difference of longitude between Greenwich and Cambridge, July 28.....	= 4 44 19.06
Established longitude of Cambridge, west of Greenwich.....	= 4 44 29.60
Observed longitude east of established longitude.....	10.54
Observed difference of longitude between Greenwich and Cambridge, August 24.....	= 4 44 17.69
Established longitude of Cambridge, west of Greenwich.....	= 4 44 29.69
Observed longitude east of established longitude.....	11.98
Difference, July 28.....	= 10.54
Do....Aug. 24.....	= 11.98
Sum.....	= 22.52
Mean correction to be applied.....	+ 11.26

TABLE V—Continued.

RECAPITULATION.

Difference of results for longitude of station near Presidio del Norte, as obtained from computations of observed moon culminations, with tabular R. A. in Nautical Almanac and Greenwich observations, 1852.

	h. m. s.
Longitude computed from tabular R. A. in Nautical Almanac	= 6 57 19.95
Longitude computed from Greenwich observations	= 6 57 39.02
Difference between Nautical Almanac and Greenwich observations	= 19.07
Observed longitude of Cambridge *east* of established longitude	= 11.26
Difference	= 7.81
Longitude computed from tabular R. A. in Nautical Almanac, with corrections applied	= 6 57 31.21
Longitude computed from Greenwich observations	= 6 57 39.02
Difference	= 7.81
Longitude of station near Presidio del Norte	= 6 57 39.02

TABLE VI.

Tabulation of results for longitude of astronomical station near Fort Duncan, derived from observations made with 30-inch transit (by Troughton & Simms) and sidereal chronometer No. 2440, (by Parkinson & Frodsham:) By J. H. Clark, under the direction of Major W. H. Emory, Chief Astronomer and Surveyor of United States and Mexican boundary survey.

Date.	Authority for elements used.	Moon's 1st limb.	Resulting longitude from observations on moon's 1st limb.	Date.	Authority for elements used.	Moon's 2d limb.	Resulting longitude from observations on moon's 2d limb.
1852.		h. m. s.	h. m. s.	1852.		h. m. s.	h. m. s.
Oct. 19	G. observations..	.....	6 42 06.7	Oct. 27	G. observations..	.....	6 41 46.2
20	.....do.....	.....	19.4	28	.....do.....	.....	6 42 01.3
21	.....do.....	6 42 00.5	6 41 57.95	29	.....do.....	.....	6 41 53.3
21	C. observations..	6 41 54.0		30	.....do.....	.....	6 42 04.4
22	G. observations..	6 42 09.5	6 42 06.90	31	.....do.....	.....	6 42 02.6
22	C. observations..	04.3		Nov. 1	.....do.....	.....	6 42 04.9
23	G. observations .	6 41 58.2	6 41 57.70	2	.....do.....	.....	6 41 46.5
23	C. observations..	57.2					
25	G. observations..	6 42 09.5	6 42 07.60				
25	C. observations.	05.7					
26	G. observations..	18.0	6 42 15.65				
26	C. observations..	13.3					
27	G. observations..	.....	6 41 49.1				
Mean longitude from moon's 1st limb = 6h. 42m. 04s.16.				Mean longitude from moon's 2d limb = 6h. 41m. 57s.03			

By giving double weight to the results of observations on moon's 1st limb, we have longitude = 6h. 42m. 01s.78

Longitude of astronomical station near Fort Duncan = 6h. 42m. 01s.78

TABLE VII.

Tabulation of results for longitude of astronomical station at Ringgold barracks, derived from observations made with 30-inch transit (maker unknown) and sidereal chronometer No. 2440, (by Parkinson & Frodsham:) By Major W. H. Emory, Chief Astronomer and Surveyor of United States and Mexican boundary survey, assisted by G. C. Gardner and J. H. Clark.

Date.	Authority for elements used.	Moon's limb observed.	Resulting longitude.
1853.			h. m. s.
June 17	Greenwich observations	First	6 35 05.99
18	Philadelphia High School	do	03.49
20	do do	Second	03.38
25	Greenwich observations	do	08.39
July 14	do do	First	02.61
15	do do	do	10.49
16	do do	do	07.41
18	Philadelphia High School	do	07.98

Longitude of Ringgold barracks = 6h. 35m. 06s.19.

Discussion of the longitude of astronomical station (g) near the mouth of the Rio Bravo del Norte.

OFFICE OF SURVEY OF UNITED STATES AND MEXICAN BOUNDARY,
Washington, D. C., February 9, 1856.

SIR: In presenting to you the final results of the computations for the longitude of the astronomical station established under your direction in 1853, near the mouth of Rio Bravo del Norte, I have been delayed for want of all the corresponding moon culminations observed at Greenwich throughout the four lunations.

The observations which were commenced by yourself and continued by Messrs. G. C. Gardner and J. H. Clark, extend through four lunations, commencing August 12, and ending November 22, 1853. The longitude resulting from the first three lunations was computed by Mr. C. N. Thom from corresponding observations at Greenwich observatory, furnished in manuscript, in 1853, by Professor Airy, astronomer royal, as well as from the corresponding observations made at Philadelphia High School observatory during the same period—giving for the position of the astronomical station, in longitude, 6*h*. 28*m*. 30*s*.5 west from Greenwich observatory.

Having recently received the printed observations of 1853, made at Greenwich and Radcliffe observatories, the observations of the fourth lunation have also been computed by Mr. Thom, and the results combined with those previously deduced from the first three lunations, without producing any change in the result hitherto adopted, as above given.

The instruments used at this station were a 46-inch transit, made by Troughton & Simms, of London, and an excellent sidereal box-chronometer, made by Parkinson & Frodsham. The transit was mounted on a massive brass stand, which rested on a pine log, imbedded about eight feet in the sand, the whole sheltered by a temporary wooden structure.

The accompanying tables, marked A, exhibit all the observations in detail, with the corrections for instrumental errors as applied, together with the several results deduced from the observations of each night. The tables marked B, C, D, exhibit the computations of those instrumental errors, with their adopted results, as follows:

1. The computed values of the equatorial intervals of each wire from the middle wire—the illumination being east—are (see table B):

I.	II.	III.	IV.	V.	VI.	VII.
51ˢ.13	34ˢ.03	17ˢ.09	00ˢ.00	17ˢ.19	34ˢ.14	51ˢ.32

with a probable error for each value of $\pm$ 0ˢ.005. The equatorial reduction of the mean of the seven wires to the middle wire $= -0^s.06 \pm 0.00$.

2. The computed value of the error of collimation of the middle wire, as deduced from a mean of twenty-five observations, made on the nights of October 27, 28, and 29, (see table C,) is $= +0^s.16 \pm 0^s.01$; hence the collimation of the mean of wires, $= +0^s.10 \pm 0^s.01 =$ (in arc) $+1''.5 \pm 0''.1$.

This value for the collimation of mean of wires has been applied to all the observations of the four lunations, in consideration of the improbability of any perceptible change in that element of the instrumental errors, due to the superior mechanism of the instrument.

3. The azimuthal deviation, however , ha be applied to the observations of each night, a then observed, on account of the unavoidable instability of the foundation of the instrument stand, and shown by the changes of deviation exhibited in column 13 of table A.

4. The equatorial value of the divisions marked on the level used with this instrument has been determined from observations made August 19, 1853, the result being $= 1''.065$ (in arc) for one division (see table D.)

The chronometer rate adopted was obtained by reducing to 0ʰ sidereal time the error for each night by interpolation; and although the rate therefrom deduced is very satisfactory and regular for the period of any one lunation, it perceptibly continues to increase throughout the series, being for the

First lunation, in August.....	$= +1^s.18$
Second lunation, in September.....	$= +1^s.70$
Third lunation, in October.....	$= +2^s.89$
Fourth lunation, in November.....	$= +4^s.60$

In reducing the observations, therefore, the actual rate for the day of observation has been used, as shown in column 18 (table A) of the tabulated computations.

In applying the corrections due to errors of collimation, level, and azimuth, the tables marked E have greatly facilitated the reduction—all which are combined in column 15 (table A) of the tabulated computations, showing the "corrected transits" of stars.

The value for "sidereal time of moon's semi-diameter passing meridian of station," shown in column 19, (table A,) has been computed by interpolation, and applied to corrected transit of the limb observed, giving the corrected transit of its centre; which element has been used in computing, by interpolation, the change of the moon's position.

The positions of the moon, as observed with the transit circle at Greenwich observatory, have served to give, by interpolation, its position for all the nights on which it was observed at the mouth of the Rio Bravo, furnishing reliable and satisfactory results; and these positions were adopted in preference to those deduced from the altazimuth observations, which differ in most cases from those actually observed by the transit circle. The positions adopted, as well as those observed at Philadelphia High School and Radcliffe observatories, during the period stated, are given in table F, being the data used in computing the longitude.

The several results for longitude, computed from the observations of each night, are exhibited in table G; the mean of which is $6^h\ 28^m\ 30^s.48 \pm 0^s.56$, being deduced from forty observations combined with the Greenwich observations, ten with Philadelphia High School, and four with

Radcliffe observations, in which equal weight is given to the results deduced from the Greenwich and Radcliffe observations; whilst double weight has been given to those deduced from Philadelphia High School observations, in consideration of its relative distance from the mouth of Rio Bravo, rendering the moon's position, as observed at Philadelphia High School observatory, so much more reliable than that deduced from Greenwich observations, wherein the law of its motion has not been strictly applied.

The probable error, whilst it may furnish an approximate estimate of the value of the result of any one series, cannot certainly be a very reliable guide, unless applied to a continued series of observations, made under various changes of condition, such as may eliminate all possible or probable errors to which observations are subjected.

In the results tabulated I have therefore introduced all such as appear reliable, giving to each its estimated value in the final result, without any regard to its "probable error," as it does not appear what personal or other constant errors may have crept into any or all the observations which have been combined in the computations. In adopting this plan, I am glad to find myself sustained by a paper in the "Astronomical Journal," of January 9, 1856, over the signature of Professor Airy, astronomer royal.

I have therefore to recommend that, until corrected by the application of more accurate laws of the moon's motion, or additional observations, that $6^h\ 28^m\ 30^s.5$ should continue to be adopted for the longitude of the astronomical station, west from the meridian of Greenwich observatory.

Very respectfully, your obedient servant,

GEORGE THOM,
Captain Topographical Engineers.

Major W. H. EMORY, *United States Commissioner.*

NOTE.—By way of experiment, the accompanying tables, marked H, I, and K, are presented, exhibiting the results combined in different ways, without, as it appears, materially changing the result given above.

1. In table H, showing the results of the moon's limbs separately combined—giving to those results their relative values adopted for each night, (as in table G,) the mean of I and II limbs being.... = 6h.28m.30s.52
2. In table I, showing those results deduced from actual corresponding observations only, and giving to those results their relative values adopted for each night, the mean of the whole being..... = 6h.28m.30s.38
3. In table K, showing the results deduced from actual corresponding observations only, of each limb separately combined—giving to those results their relative values adopted for each night—a mean of the two limbs being..... = 6h.28m.30s.45

GEORGE THOM,
Captain Topographical Engineers.

TABLE A.

Meridian transit observations made at mouth of the Rio Grande with 46-inch transit, (by Troughton & Simms,) and sidereal chronometer No. 2440, (by Parkinson & Frodsham,) and computations of apparent right ascension and longitude deduced therefrom. By G. C. Gardner and J. H. Clark, obs'rs; C. N. Thom, comp.

Date.	No. for reference.	Name of object.	Illuminated end of axis.	Seconds of transit over the seven wires. I.	II.	III.	IV.	V.	VI.	VII.	Concluded transit over the mean of the seven wires.	Error of— Collima'n, (azimuth.)	Level.	Corrected transit.	Tabular right ascension of known stars and moon's centre.	Chronometer apparently fast of sidere'l time.	Adopted chronometer fast at 0h. sidere'l time and (gaining rate.)	Sidereal time of semidiam. passing meridian of station.	Apparent right ascension of centre deduced from observations made at Royal Observ'y, Greenwich.	Long. west of Greenwich deduced from observations of each sight.
1853.				s.	s.	s.	s.	s.	s.	s.	h. m. s.	"	"	h. m. s.	h. m. s.	h. m. s.	m. s.	h. m. s.	h. m. s.	h. m. s.
Aug. 12	1	Moon's 1st limb.	E.	.....	.....	16.2	34.8	53.3	12.0	30.6	17 44 34.72	+ 2.44 (— 5.59)	+ 1.65	17 44 34.72	15.44 94.73	.....	45 29.00	1 11.56	15 44 14.26	6 28 35.04
	2	ψ Ophiuchi		04.6	22.8	41.0	59.3	17.4	35.3	53.6	18 00 59.17	+ 1.50	1.65	18 00 59.08	16 15 31.72	1 45 27.36	(+ 1.00)	.....	.....	.....
	3	α Scorpii		55.8	14.8	34.2	53.0	11.8	30.7	50.2	18 05 52.93	— 1.59	1.65	18 05 52 80	16 20 25.54	1 45 27.26		.....	.....	.....
	4	G. C. 1402.....		06.6	27.2	47.5	08.4	28.8	49.4	10.3	18 26 08.31		1.65	18 26 08.11	16 40 40.81	1 45 27.30		.....	.....	.....
	5	G. C. 1418.....		19.3	36.8	54.2	11.4	28.6	45.8	03.3	18 36 11.34		+ 1.65	18 36 11.94	16 50 44.17	1 45 27.07		.....	.....	.....
13	6	Moon's 1st limb.	E.	28.6	47.7	06.8	26.0	45.2	04.2	23.3	18 46 25.97	+ 1.50	+ 4.81	18 46 25.85	16 45 08.76	.....	.....	1 13.02	16 45 08.12	6 28 40.00
	7	θ Ophiuchi.... ...		34.3	53.2	11.8	30.8	49.5	08.3	27.2	18 58 30.73	(— 8.93)	4.81	18 58 30.55	17 13 00.89	1 45 29.66	45 30.06	.....	17 13 00.91	.....
	8	δ Ophiuchi.....		59.6	18.3	36.8	55.5	14.2	32.7	51.6	19 02 55.53		4.74	19 02 55.36	17 17 25.50	1 45 29.86	(+ 2.25)	.....	17 17 25.48	.....
	9	G. C. 1532.....		11.4	28.6	45.5	02.6	20.2	36.8	54.3	19 26 02.77		4.40	19 26 02.81	17 40 39.93	1 45 29.88		.....	.....	.....
	10	γ Draconis		19.5	46.8	14.4	42.2	09.4	38.6	04.3	19 38 41.80		4.40	19 38 42.68	17 53 13.37	1 45 29.51		.....	.....	.....
	11	G. C. 1575.....		02.3	19.7	37.2	54.3	11.6	28.8	46.4	19 45 54.33		+ 4.40	19 45 54.54	18 00 25.96	1 45 29.28		.....	.....	.....
15	12	ν¹ Sagittarii.	W.	58.2	16.5	34.6	53.3	12.2	30.3	48.6	20 30 53.39	— 1.50	+ 0.82	20 30 52.85	18 45 19.73	1 45 33.19	45 33.40	.....	.....	.....
	13	ξ° Sagittarii		.....	56.8	14.4	33.3	51.6	09.8	28.3	20 34 33.2	(— 8.59)	0.82	20 34 32.78	18 48 59.55	1 45 33.23	(+ 2.26)	.....	.....	.....
	14	Moon's 1st limb.		12.3	31.9	51.2	10.7	30.3	49.8	09.3	20 57 10.79		0.82	20 57 10.23	18 55 05.69	.....		1 14 85	18 55 04.71	6 28 35.91
	15	κ¹ Sagittarii		24.8	43.8	02.5	21.6	40.3	59.2	18.0	21 13 21.46		0.82	21 13 20.90	19 27 47.78	1 45 33.12		.....	.....	.....
	16	γ Aquilæ.....		59.4	16.6	34.0	51.6	09.2	26.3	43.3	21 24 51.49		1.11	21 24 51.29	19 39 18.25	1 45 33.04		.....	....	.....
	17	β Sagittarii		33.7	53.3	11.8	31.2	50.4	09.8	29.3	21 33 31.36		1.29	21 33 30.79	19 47 57.71	1 45 33.08		.....	....	.....
	18	α° Capricorni		37.3	54.6	11.8	29.4	47.3	04.6	22.3	21 55 29.61		1.84	21 55 29.24	[illegible]9 55.92	1 45 33.32		.....	.....	.....
	19	α Pavonis		03.4	35.0	05.8	37.6	09.6	40.9	12.8	21 59 37.67		+ 1.92	21 59 36.68	[illegible]3.48	1 45 33.20		.....	.....	.....
16	20	λ° Sagittarii.....	E.	26.6	45.4	04.3	22.9	41.8	00.7	19.6	21 13 23.04	+ 1.50	+ 2.20	21 13 22.16	19 [illegible]7.78	1 45 34.38	45°34.58	.....	.....	.....
	21	γ Aquilæ		00.8	18.2	35.3	52.6	10.0	27.3	44.5	21 24 52.67	(— 19.21)	2.20	21 24 52.56	19 [illegible].25	1 45 34.31	(+ 0.88)	.....	.....	.....
	22	α Aquilæ		21.5	38.6	55.8	13.2	30.8	47.7	05.3	21 29 13.27		2.20	21 29 13.11	19 [illegible].66	1 45 34.45		.....	.....	.....
	23	δ Sagittarii.....		35.4	54.8	13.6	33.0	52.6	12.1	31.2	21 33 33.24		2.20	21 33 32.28	19 [illegible].70	1 45 34.58		.....	.....	.....
	24	Moon's 1st limb.		05.3	24.1	43.3	02.6	21.8	41.5	00.3	22 02 02.70		1.65	22 02 01.81	20 00 [illegible]51	.....		1 13 45	20 00 25.36	6 28 39.65
	25	ρ Capricorni		12.2	30.0	47.6	05.7	23.8	42.0	59.8	22 06 05.87		1.10	22 06 05.08	20 20 [illegible]36	1 45 34.52		.....	.....	.....
	26	α Cygni		49.2	13.3	37.2	01.3	25.5	49.3	13.4	22 22 01.31		+ 1.10	22 22 02.15	20 36 27.31	1 45 34.64		.....	.....	.....

REMARKS.—Equatorial intervals of each wire from the middle wire, (illumination east.)

I.	II.	III.	V.	VI.	VII.
51s.13	34s.03	17s.09	17s.19	34s.14	51s.32

Equatorial reduction of mean of wires to middle wire..... = — 0s.00 ± 0s.00

Collimation of middle wire..... = + 0s.16 ± 0s.01

Collimation of mean of wires..... = + 0s.19 ± 0s.01 (in arc = + 1″5 ± 0″.1

Meridian transit observations made at mouth of Rio Grande, &c.—Continued.

Date.	Number for reference.	Name of object.	Illuminated end of axis.	Seconds of transit over the seven wires. I.	II.	III.	IV.	V.	VI.	VII.	Concluded transit over the mean of the seven wires.	Error of— Collima'n, (azimuth.)	Level.	Corrected transit.	Tabular right ascension of known stars and moon's centre.	Chronometer apparently fast of sider'l time.	Adopted chronometer fast at 0h. sider'l time and (gaining rate.)	Sidereal time of semi-diam. passing meridian of station.	App. R. A. of centre deduced from observations made at High School Observatory, Phila.	Royal Observatory, Gr'nwich.	Long. west of Greenwich deduced from observations of each night.
1853.				s.	s.	s.	s.	s.	s.	s.	h. m. s.	"	"	h. m. s.	h. m. s.	h. m. s.	m. s.	m. s.	h. m. s.	h. m. s.	h. m. s.
Aug. 17a	27	β Capricorni	W.	30.2	47.6	05.3	22.8	40.8	58.4	16.0	21 58 23.01	— 1.50	+ 0.96	21 58 22.42	20 12 47.15	1 45 35.32	45 35.16			20 12 47.19	
	28	ρ Capricorni		12.4	30.6	48.2	06.3	24.3	42.4	00.3	22 06 06.36	(— 12.10)	0.96	22 06 05.79	20 20 30.57	1 45 35.15	(+ 0.37)				
	29	α Cygni		49.9	13.8	37.6	02.3	26.5	50.0	14.2	22 22 02.01		0.96	22 22 02.31	20 36 27.50	1 45 34.81					
	30	61 Cygni		50.8	12.7	34.3	56.0	17.8	39.3	01.2	22 45 56.01		1.96	22 45 56.20	21 00 20.96	1 45 35.94					
	31	ξ Cygni		19.0	38.8	58.4	18.5	37.8	57.6	17.0	22 52 18.16		1.34	22 52 18.21	21 06 43.06	1 45 35.15					
	32	G. C. 1900		47.8	05.8	23.3	41.6	59.4	17.2	35.3	22 59 41.49		1.46	22 59 40.88	21 14 06.39	1 45 34.56					
	33	Moon's 1st limb.		52.0	11.4	29.9	48.8	07.6	26.2	45.1	23 03 48.71		1.48	23 03 48.05	21 03 08.82	.....		1 11.12	.....	21 03 07.50	6 28 29.98
	34	Moon's 2d limb.		14.7	38.3	52.3	10.9	30.0	48.6	07.2	23 06 11.07		1.51	23 06 10.41	21 03 08.82	.....		1 11.12	.....	21 03 07.50	.....
	35	ε Pegasi		43.7	01.2	17.8	....	52.8	10.3	27.8	23 22 35.67	— 2.44	1.51	23 22 35.37	21 37 00.18	1 45 35.19					
	36	δ Capricorni		.....	57.8	15.3	33.8	51.3	08.8	26.7	23 24 33.34		1.65	23 24 32.68	21 38 57.68	1 45 34.99					
	37	μ Capricorni		02.3	19.6	37.3	54.8	12.2	29.7	47.5	23 30 54.77	— 1.50	+ 2.06	23 30 54.25	21 45 18.95	1 45 35.30					
18	38	δ Capricorni	E.	40.2	58.3	16.0	33.5	51.6	09.3	27.4	23 34 33.76	+ 1.50	+ 2.06	23 34 33.69	21 38 57.69	1 45 35.32	45 35.32			21 38 57.77	
	39	α Gruis		20.6	46.2	11.6	36.7	02.4	27.5	52.7	23 44 36.81	(— 18.67)	2.06	23 44 35.94	21 59 00.10	1 45 35.14	(+ 0.05)				
	40	Moon's 2d limb.		54.3	12.6	30.5	48.7	07.3	25.4	43.8	24 03 48.94		2.06	24 03 48.98	22 01 57.03	.....		1 08.51	.....	22 01 55.78	6 28 20.60
	41	σ Aquarii		37.8	55.2	12.4	29.9	47.5	04.8	22.3	24 08 29.99		1.89	24 08 29.43	22 22 54.10	1 45 35.33					
	42	ξ Pegasi		53.4	10.8	28.2	45.6	03.3	20.2	37.7	24 19 45.60		1.35	24 19 45.44	22 34 10.03	1 45 35.41					
	43	G. C. 2047		36.2	54.6	13.5	32.3	50.8	09.3	28.3	24 28 39.14		1.00	24 28 38.98	22 43 57.19	1 45 35.09					
	44	δ Aquarii		35.4	53.6	11.3	28.9	47.0	04.5	23.4	24 32 29.01		0.89	24 32 28.29	22 46 52.88	1 45 35.41					
	45	α Piscis Australis		10.5	30.3	50.2	09.6	29.8	49.5	09.3	24 35 09.89		+ 0.68	24 35 08.84	22 49 33.56	1 45 35.28					
19	46	σ Aquarii	W.	37.7	55.4	12.6	30.3	47.7	05.2	26.6	24 08 30.21	— 1.50	— 0.27	24 08 29.22	22 22 54.11	1 45 35.11	45 35.26		22 22 54.10		
	47	ξ Pegasi		53.6	11.3	28.4	45.8	03.3	20.5	38.0	24 19 45.84	(— 21.45)	0.27	24 19 45.31	22 34 10.04	1 45 35.27	(+ 0.75)				
	48	δ Aquarii		35.7	53.6	11.2	29.1	47 3	04.8	22.7	24 32 29.20		0.27	24 32 28.08	22 46 52.89	1 45 35.19			22 46 52.67		
	49	α Piscis Australis		10.8	30.7	50.3	10.4	30.5	49.8	09.9	24 35 10.34		0.27	24 35 08.85	22 49 33.58	1 45 35 28					
	50	η Pegasi		11.3	29.2	46.4	04.3	22.0	39.3	57.2	24 43 04.94		0.27	24 43 03.85	22 57 28.59	1 45 35.27					
	51	ψ Aquarii		29.0	46.3	03.4	20.6	38 2	55.0	11.9	24 52 20.63		0.27	24 52 19.75	23 06 44.72	1 45 35.03			23 06 44.49		6 6 28 22.33
	52	Moon's 2d limb.		34.2	51.7	09.5	27.6	45.3	03.3	20.6	24 57 27.46		— 0.27	24 57 28.47	22 56 39.41	.....		1 06.06	23 07 34.76	22 56 38.29	6 6 28 33.62
20	53	α Piscis Australis	E.	12.1	31.8	51.6	11.5	31.3	51.3	11.3	0 35 11.56	+ 1.50	+ 0.89	0 35 10.48	22 49 33.59	1 45 36.89	45 36.81				
	54	α Pegasi		12.7	30.6	48.2	05.6	23.3	40.8	57.7	0 43 05.70	(—18.19)	— 0.89	9 43 05.56	22 57 28.60	1 45 36.90	(+ 1.49)				
	55	φ Aquarii		30.3	47.6	04.8	21.8	39.5	56.6	13.6	0 52 22.03		0.89	0 52 21.44	23 06 44.74	1 45 36.70					
	56	ψ[5] Aquarii		06.4	23.6	41.2	58.3	15.9	33.2	50.4	0 56 58.43		0.89	0 56 57.76	23 11 20.86	1 45 36.90					
	57	33 Piscium		36.7	53.8	11.1	27.8	45.3	02.4	19.8	1 43 28.13		1.61	43 27.48	23 57 50.66	1 45 36.82					
	58	Moon's 2d limb.		57.3	14.6	32.0	49.6	07.3	24.7	42.2	1 47 49.67		2.06	1 47 49.03	23 47 50.04	.....		1 04.30	.....	23 47 49.06	6 28 14.71
	59	12 Ceti		20.3	37.6	54.3	11.6	28.8	46.0	02.7	2 08 11.99		— 2.06	2 08 11.86	0 22 34.98	1 45 36.98					

21	60	33 Piscium	W.	37.8	55.3	12.2	29.4	47.0	63.7	20.9	1 43 28.20	− 1.50	+ 0.13	1 43 28.50	23 57 50.68	1 45 37.82	45 38.11	.....	.....	.....	.....
	61	α Andromedæ		29.8	49.3	08.6	28.2	47.6	06.7	26.1	1 46 28.04	(− 8.52)	0.13	1 46 27.91	0 00 49.92	1 45 37.99	(+ 1.61)	.....	.....	.....	.....
	62	12 Ceti		21.6	38.8	55.5	12.7	30.2	47.6	04.3	2 08 12.96		0.13	2 08 12.58	0 22 34.30	1 45 38.28		.....	.....	.....	.....
	63	20 Ceti		19.1	36.3	52.9	10.3	27.6	44.4	01.8	2 31 10.34		0.22	2 31 09.99	0 45 31.66	1 45 38.33		.....	0 45 31.75	.....	*b* 6 28 27.27
	64	Moon's 2d limb.		09.6	30.2	37.1	54.9	12.5	29.7	47.3	2 35 54.90		0.24	2 35 54.57	0 36 25.73	.....		1 03.20	*c* 0 46 19.72	0 36 24.88	*d* 6 28 35.90
	65	ε Piscium		07.8	25.2	42.3	59.4	16.8	34.0	50.9	2 40 59 49		+ 0.27	2 40 59.22	0 55 21.00	1 45 38.22		.....	0 55 20.96	.....	... .
22	66	α Andromedæ	E.	31.8	50.9	10.5	30.0	49.6	08.4	28.2	1 46 29.91	+ 1.50	+ 1.65	1 46 30.18	0 00 49.93	1 45 40.25	45 40.03	.....	.....	.....	.....
	67	γ Pegasi		29.6	47.3	04.7	22.3	40.3	57.5	15.4	1 51 22.44	(−16.63)	1.65	1 51 22.42	0 05 42.26	1 45 40.16	(+ 1.43)	.....	.....	.....	.....
	68	θ Ceti		31.2	48.3	05.4	22.7	40.0	57.6	14.8	3 02 22.66		1.59	3 02 22.40	1 16 42.37	1 45 40.03		.....	.....	.....	.....
	69	G. C. 135		44.7	07.6	30.2	52.4	15.5	37.6	00.5	3 13 52.64		1.37	3 13 53.25	1 28 13.35	1 45 39 90		.....	.....	.....	.....
	70	γ Piscium		37.6	54.8	.....	.....	.....	03.3	20.8	3 19 29.05	+ 2.44	1.26	3 19 28.89	1 33 48.76	1 45 40.13		.....	.....	.....	. .....
	71	Moon's 2d limb.		54.3	12.1	29.2	46.8	04.3	22.0	39.3	3 22 46.86	+ 1.50	+ 1.23	3 22 46.66	1 23 30.63	.....		1 02.79	.....	1 23 29.32	6 28 27.22
23	72	ε Piscium	W.	39.6	46.8	03.8	21.2	38.7	55.6	12.9	3 23 21.23	− 1.50	+ 2.33	3 23 20.88	1 37 39.91	1 45 40.97	45 40.98	.....	.....	.....	.....
	73	G. C. 195		04.3	21.6	38.4	55.6	13.3	30.3	47.4	3 50 55.84	(−18.97)	2.33	3 50 55.49	2 05 14.42	1 45 41.07	(+ 1.07)	.....	.....	.....	.....
	74	Moon's 2d limb.		32.3	50.3	07.7	25.7	43.4	01.0	18.3	4 09 25.53		1.92	4 09 25.24	2 10 05.09	....		1 02.96	.....	2 10 04.59	6 28 33.54
	f 75	B. A. C. 845		51.0	68.6	25.4	42.8	00.3	17.5	34.8	4 22 42.91		1.59	4 22 42.53	2 37 01.52	1 45 41.08		.....	.....	2 37 01.45	.....
	f 76	π Arietis		54.9	12.9	30.6	48.5	06.4	24.2	42.2	4 26 48.53		1.51	4 26 48.32	2 41 07.21	1 45 41.11		.....	.....	2 41 07.21	.....
24	77	B. A. C. 845	E.	52.2	09.4	26.6	43.8	01.3	18.5	36.3	4 22 44.01	+ 1.50	+ 0.55	4 22 43.83	2 37 01.48	1 45 42.35	45 42.17	.....	.....	.....	.....
	78	π Arietis		56.1	13.7	31.8	49.3	07.4	25.2	43.2	4 26 49.53	(− 15.72)	0.59	4 26 49.50	2 41 07.24	1 45 42.27	(+ 1.47)	.....	.....	2 41 07.23	.....
	79	G. C. 251		37.8	56.2	14.3	32.6	50.8	09.0	27.6	4 36 32.61		0.55	4 36 32.66	2 50 50.48	1 45 42.18		....	.....	.....	.....
	80	α Ceti		28.8	46.0	02.8	19.2	36.8	54.3	11.5	4 40 20.01		+ 0.24	4 40 19.71	2 54 37.36	1 45 42.35		.....	.....	.....	.....
	81	ξ Arietis		16.6	34.8	52.[illegible]	[illegible].2	29.9	47.6	06.9	4 52 11.27		− 0.37	4 52 11.25	3 06 28.88	1 45 42.40		.....	.....	3 06 28.85	.....
	82	Moon's 2d limb.		52.2	10.4	27 7[illegible].3		04.3	22.3	40.2	4 56 46.20		0.99	4 56 46.03	2 57 07.66	.....		1 03.75	.....	2 57 07.07	6 28 32.10
	83	α Persei		.....	41.8	08.4	34.3	00.9	26.6	53.3	4 59 34.38		− 1.23	4 59 35.06	3 13 52.67	1 45 42.39		.....	.....	.....	.....
Sept. 12*g*	84	β Lyræ	W.	54.8	15.3	35.8	56.2	16.6	36.8	57.3	20 30 56.11	− 1.50	+ 0.68	20 30 56.01	18 44 40.47	1 46 15.54	46 15.70	.....	.....	.....	.....
	85	ο Sagittarii		14.7	33.3	51.5	10.0	28.4	46.9	05.2	20 42 10.00	(− 2.42)	0.68	20 42 09.79	18 55 54.03	1 46 15.76	(+ 1.20)	... .	.....	.....	.....
	86	π Sagittarii		23.8	42.3	00.3	18.7	37.2	55.2	14.3	20 47 18.83		0.68	20 47 18.62	19 01 02.98	1 46 15.64		.....	.....	.....	.....
	87	δ Aquilæ		31.4	48.6	05.3	22.8	39.6	56.8	14.0	21 04 22.64		0.68	21 04 22.52	19 18 06.85	1 46 15.68		... .	.....	.....	.....
	88	γ Aquilæ		41.6	59.2	16.0	33.5	50.8	08.3	25.7	21 25 33.59		0.92	21 25 33.50	19 39 18.00	1 46 15.50		... .	.....	.....	.....
	89	Moon's 1st limb.		54.3	13.7	32.9	52.6	11.8	31.0	50.2	21 39 52.36		1.10	21 39 52.16	19 37 45.84	.....		1 13.30	.....	19 37 45.20	6 28 30.23
	90	σ Capricorni		18.2	36.4	54.2	12.6	30.5	48.5	06.7	21 57 12.44		1.10	21 57 12.27	20 10 56.68	1 46 15.59		.....	.....	.....	.....
	91	π Capricorni		18.3	36.4	54.0	12.3	30.2	48.4	06.3	22 05 12.27		+ 1.10	22 05 12.11	20 18 56.44	1 46 15.67		.....	.....	.....	.....
13	92	σ Capricorni	E.	18.8	37.1	55.3	12.8	31.4	49.2	07.7	21 57 13.19	+ 1.50	+ 0.27	21 57 12.93	20 10 56.64	1 46 16.36	46 16.34	.....	20 10 56.41	20 10 56.67	.....
	93	π Capricorni		18.8	36.8	54.8	12.9	30.8	47.8	06.9	22 05 12.81	(− 5.27)	0.27	22 05 12.66	20 18 56.34	1 46 16.23	(+ 0.67)	.....	20 18 56.29	20 18 56.43	*b* 6 28 30.48
	94	Moon's 1st limb.		27.6	46.7	05.8	21.8	43.8	02.3	21.6	22 41 24.66		0.27	22 41 24.51	20 40 04.07	....		1 11.31	*A* 20 52 39.82	20 40 03.21	*d* 6 28 30.60
	95	ξ Cygni		00.2	19.8	39.3	58.7	18.8	38.3	57.9	22 52 59.00		0.27	22 52 59.10	21 06 42.92	1 46 16.18		.....	.....	.....	.....
	96	ξ Capricorni		39.6	58.2	16.6	35.3	53.8	12.3	30.8	23 04 35.23		0.16	23 04 35.06	21 18 18.49	1 49 16.57		.....	21 18 18.22	....	... .
	97	β Aquarii		16.4	33.4	50.3	07.6	25.0	42.2	59.5	23 10 07.77		0.11	23 10 07.70	21 23 51.30	1 46 16.40		.....	.....	.....	.....
	98	ε Capricorni		15.1	33.3	51.4	09.3	27.8	45.8	04.2	23 15 09.56		0.05	23 15 09.40	21 28 53.04	1 46 16.15		.....	.....	21 28 53.25	.....
	99	G. C. 1931		15.3	09.3	27.3	45.6	03.8	21.6	40.0	23 20 45.56		+ 0.00	23 20 45.40	21 34 29.16	1 46 16 30		.....	.....	.....	..... .

a Moon's second limb imperfect. *b* Deduced from corresponding observations made at Greenwich Observatory. *c* + 66.21 = computed time of moon's semi-diam. passing meridian.
d Deduced from corresponding observations made at Phila. High School Observatory. *e* 63.15*s.* = computed time of moon's semi-diam. passing meridian. *f* Cloudy during the observations on Nos. 75 and 76.
g Sept. 12, very hazy. No culmination could be taken previous to this because of the bad weather. *h* 71*s.*46 computed time of moon's semi-diameter passing meridian.

Meridian transit observations made at mouth of Rio Grande, &c.—Continued.

Date.	No. for reference.	Name of object.	Illuminated end of axis.	Seconds of transit over the seven wires. I.	II.	III.	IV.	V.	VI.	VII.	Concluded transit over the mean of the seven wires.	Error of— Collima'n, (azimuth.)	Level.	Corrected transit.	Tabular right ascension of known stars and moon's centre.	Chronometer apparently fast of sider'l time.	Adopted chronometer fast at 0h. sider'l time and (gaining rate.)	Sidereal time of semidiam. passing meridian of station.	App. R. A. of centre deduced from observations made at— High School Observatory, Phila.	oyal Observatory, Gr'nwich.	Long. west of Greenwich deduced from observations of each night.
1853.				s.	s.	s.	s.	s.	s.	s.	h. m. s.	"	"	h. m. s.	h. m. s.	h. m. s.	m. s.	m. s.	h. m. s.	h. m. s.	h. m. s.
Sept. 14a	100	ζ Cygni	W.	01.0	20.8	40.3	00.2	19.4	39.3	59.4	22 53 00.10	— 1.50	— 0.68	22 52 59.92	21 06 42.91	1 46 16.91	46 17.04	.....	.....	....	....
	101	ζ Capricorni		.....	59.2	17.3	35.6	54.5	[illegible]8	31.3	23 04 35.94	(— 5.48)	0.68	23 04 35.44	21 18 18.48	1 46 16.96	(+ 1.98)	.....	.....	....	....
	102	β Aquarii		17.2	34.4	51.3	08.7	25.8	43.0	00.3	23 10 08.67		0.68	23 10 08.34	21 23 51.30	1 46 17.00		.....	.....	.....	....
	103	ε Capricorni		15.9	34.3	52.3	10.8	28.8	47.1	04.7	23 15 10.56		0.68	23 15 10.14	21 28 53.24	1 46 16.90		.....	.....	.....	....
	104	ε Pegasi		25.6	42.8	00.0	17.5	34.8	52.3	09.3	23 23 17.47		0.68	23 23 17.22	21 37 00.19	1 46 17.03		.....	.....	.....	....
	105	μ Capricorni		43.5	01.4	18.7	36.7	54.3	.....	.....	23 31 36.54		0.73	23 31 36.16	21 45 19.05	1 46 17.11		.....	.....	.....	....
	106	Moon's 1st limb		31.6	50.3	08.4	27.0	45.5	03.8	22.2	23 39 26.97		0.78	23 39 26.57	21 39 03.06	.....		1 08.88	.....	21 39 01.98	6 28 37.08
	107	ι Aquarii		56.4	14.2	.....	.....	.....	.....	.....	23 44 49.45		— 0.82	23 44 48.99	21 58 31.99	1 46 17.00		.....	.....	.....	....
15	108	μ Capricorni	E.	.....	.....	.....	37.8	55.7	13.4	31.2	23 31 38.17	+ 1.50	— 0.27	23 31 38.03	21 45 19.05	1 46 18.98	46 18.91	.....	.....	.....	... .
	109	ι Aquarii		58.3	15.8	33.3	.....	08.8	26.4	44.2	23 44 51.05	(— 6.87)	0.27	23 44 50.90	21 58 31.99	1 46 18.99	(+ 1.93)	.....	....	....	....
	110	G. C. 1993		34.2	51.4	08.6	26.0	43.3	00.5	17.7	23 55 25.96		0.27	23 55 25.78	22 09 06.85	1 46 18.93		.....	.....	.....	....
	111	G. C. 2019		.....	49.2	09.8	30.2	50.6	10.7	31.5	0 09 30.08		0.27	0 09 29.79	22 23 11.09	1 46 18.70		.....	.....	.....	....
	112	ζ Pegasi		37.3	54.6	12.0	29.2	46.6	03.8	21.3	0 20 29.26		0.22	0 20 29.22	22 34 10.18	1 46 18.94		.....	.....	....	....
	113	Moon's 1st limb.		54.6	12.3	30.2	48.4	06.3	24.2	42.0	0 33 48.29		0.14	0 33 48.09	22 34 18.61	.....		1 06.56	.....	22 34 17.31	6 28 37.19
	b114	Moon's 2d limb.		06.5	24.4	41.8	00.3	18.3	36.3	53.8	0 36 00.20		0.13	0 36 00.00	22 34 18.61	.....		1 06.56	.....	22 34 17.31	.....
	115	φ Aquarii		.....	29.5	46.8	04.3	21.4	38.5	55.6	0 53 03.98		0.13	0 53 03.88	23 06 44.97	1 46 18.91		.....	.....	.....	....
	116	ψ^2 Aquarii		48.3	06.0	22.8	40.3	57.7	14.8	32.6	0 57 40.34		— 0.13	0 57 40.16	23 11 21.11	1 46 19.05		.....	.....	.....	....
16	117	ϕ Aquarii	W.	.....	32.3	.....	06.5	23.3	40.2	57.6	0 53 06.20	— 1.50	+ 0.82	0 53 05.79	23 06 44.97	1 46 20.82	46 20.98	.....	.....	....	....
	118	ψ^2 Aquarii		50.8	07.8	25.3	42.6	59.8	17.3	34.6	0 57 42.60	(— 8.97)	0.82	0 57 42.21	23 11 21.11	1 46 21.10	(9.20)	.....	23 11 21.32	.....	c6 28 30.72
	119	Moon's 1st limb.		04.5	22.3	39.8	57.4	14.8	32.6	50.3	1 24 57.39		0.82	1 24 57.02	23 26 11.40	.....		1 04.68	d23 35 38.50	23 26 09.87	e6 28 23.86
	120	Moon's 2d limb.		14.2	31.8	49.4	07.1	24.8	42.3	59.6	1 27 07.03		0.82	1 27 06.66	23 26 11.40	.....		1 04.68	d23 36 38.50	23 26 09.87	.....
	121	33 Piscium		.....	38.3	55.3	.....	.....	.....	04.2	1 44 12.67		0.95	1 44 12.26	23 57 51.03	1 46 21.05		.....	23 57 51.10	23 57 51.21	.....
	122	α Andromedæ		13.3	32.6	.....	12.0	.....	50.2	09.8	1 47 11.58		1.05	1 47 11.46	0 00 50.27	1 46 21.19		.....	.....	.....	....
	123	γ Pegasi		11.2	28.6	46.3	04.0	21.7	39.3	57.0	1 52 04.01		1.23	1 52 03.87	0 05 42.60	1 46 21.27		.....	.....	.....	....
	124	β Ceti		42.5	00.4	18.3	36.8	54.6	12.8	29.8	2 22 36.60		+ 1.23	2 22 36.19	0 36 14.90	1 46 21.29		.....	.....	.....	....
17f	125	γ Pegasi	E.	13.2	30.6	48.3	06.0	23.8	41.3	59.3	1 52 06.07	+ 1.50	— 0.41	1 52 06.09	0 05 42.61	1 46 23.48	46 23.31	.....	.....	.....	....
	126	Moon's 2d limb.		59.6	16.8	34.4	51.6	09.2	26.5	44.2	2 15 51.76	(— 3.47)	0.41	2 15 51.34	0 15 27.89	.....	(+ 2.45)	1 03.41	.....	0 15 26.56	6 28 24.66
	127	β Ceti		44.7	02.8	20.9	38.5	56.8	14.7	33.1	2 22 38.79		0.34	2 22 38.70	0 36 14.92	1 46 23.78		.....	.....	.....	....
	128	20 Ceti		04.3	21.5	38.3	55.7	12.8	29.8	47.2	2 31 55.66		1.24	2 31 55.65	0 45 32.13	1 46 23.44		.....	0 45 32.14	0 45 32.21	....
	129	G. C. 62		58.3	18.2	37.5	57.3	.....	37.2	.....	2 37 57.55		0.17	2 37 57.51	0 51 33.81	1 46 23.70		.....	.....	.....	....
	130	G. C. 66		53.3	10.5	27.6	44.6	02.3	19.3	36.6	2 41 44.89		— 0.13	2 41 44.78	0 55 21.42	1 46 23.36		.....	.....	.....	....
	131	G. C. 121		03.5	20.8	37.7	55.0	12.3	.....	46.8	3 08 55.02		+ 0.01	3 08 55.10	1 22 31.48	1 46 23.62		.....	.....	....	....

18g	132	δ	Piscium	W.	40.7	.....	15.3	32.4	49.8	06.3	24.3	2 27 32.48	− 1.50	−	0.96	2 27 32.01	0 41 05.90	1 46 25.96	46 25.89	.....	0 41 05.93	0 41 06.05	.....
	133		G. C. 66		56.3	13.8	30.8	48.3	05.3	22.4	39.8	2 41 48.10	(− 7.09)		0.96	2 41 47.78	0 55 21.43	1 46 26.35	(+ 2.81)	.....	.....	.....	e 6 28 29.69
	134		Moon's 2d limb.		21.6	39.3	56.6	13.8	31.3	48.8	06.3	3 03 13.96			1.07	3 03 13.62	1 03 04.57	.....	.....	1 03.83	A1 12 52.18	1 03 03.29	e 6 28 36.03
	135		G. C. 121		06.7	24.0	40.5	58.3	15.5	32.6	49.8	3 08 56.20			1.10	3 08 57.86	1 22 31.46	1 46 26.40		.....	.....	.....	.....
	136	ρ	Piscium		24.8	42.0	58.8	16.2	33.3	50.3	07.7	3 20 16.16			1.10	3 20 15.82	1 33 49.33	1 46 26.49		.....	1 33 49.36	.....	.....
	137	o	Piscium		15.3	31.6	49.8	07.2	24.3	41.5	58.8	3 24 07.07			1.10	3 24 06.75	1 37 40.46	1 46 26.18		.....	1 37 40.43	1 37 40.57	.....
	138		G. C. 181		14.3	36.8	00.2	22.8	45.5	08.4	31.2	3 41 22.74		−	1.10	3 41 22.35	1 54 56.37	1 46 25.98		.....	.....	.....	.....
Oct. 8	139	ξ	Cygni	E.	10.2	29.7	49.4	09.3	28.8	48.5	08.3	22 54 09.17	+ 1.50	−	0.52	22 54 09.19	21 06 42.57	1 47 26.62	47 26.98	.....	.....	.....	.....
	140	ε	Pegasi		34.8	52.1	09.3	26.6	44.3	01.5	18.5	23 24 26.73	(− 10.81)		1.10	23 24 26.54	21 36 59.98	1 47 26.56	(+ 2.73)	.....	.....	.....	.....
	141		G. C. 1993		42.2	59.3	16.6	33.7	50.8	08.4	25.7	23 56 33.81			0.48	23 56 33.47	22 09 06.69	1 47 26.78		.....	.....	.....	.....
	142		G. C. 1999		41.8	58.8	15.6	33.0	50.2	07.3	24.3	0 01 33.00		−	0.12	0 01 32.76	22 14 06.01	1 47 26.75		.....	.....	.....	.....
	143		G. C. 2019		37.3	57.8	17.9	38.4	58.8	18.9	39.8	0 10 38.41		+	0.44	0 10 37.81	22 23 10.95	1 47 26.86		.....	.....	.....	.....
	144	ξ	Pegasi		44.6	02.4	19.3	36.9	54.3	11.7	29.2	0 21 36.91			1.10	0 21 36.87	22 34 10.08	1 47 26.79		.....	.....	.....	.....
	145	α	Piscis Australis		01.8	21.8	41.3	01.5	21.3	40.8	00.6	0 37 01.30			1 10	0 37 00.77	22 49 23.74	1 47 27.03		.....	.....	.....	.....
	146	α	Pegasi		02.6	20.3	37.8	55.3	13.3	30.8	48.5	0 44 55.51		+	1.10	0 44 55.46	22 57 28.74	1 47 26.72		.....	.....	.....	.....
9	147	σ	Sagittarii	W	28.3	46.5	05.0	23.4	41.8	00.1	18.6	20 43 23.39	+ 1.59	+	0.13	20 43 23.83	18 55 53.55	1 47 29.28	47 29.39	.....	.....	.....	.....
	148	π	Sagittarii		37.4	55.6	13.6	32.3	50.4	07.8	27.3	20 48 32.19	(− 13.74)		0.13	20 48 31.65	19 01 02.51	1 47 29.14	(2.08)	.....	.....	.....	.....
	149		Moon's 1st limb.		21.5	41.0	00.3	19.6	39.4	58.6	17.8	21 22 19.74			0.13	21 22 19.75	19 18 53.07	.....		1 13.85	.....	19 18 51.49	6 28 38.86
	150	α	Aquilæ		15.6	32.4	49.3	07.3	24.6	41.8	59.2	21 31 07.17	+ 1.50		0.07	21 31 06.98	19 43 38.00	1 47 28.98	47 29.39	.....	.....	.....	.....
	151	b	Sagittarii		29.3	48.3	07.5	26.8	46.3	05.4	24.7	21 35 26.90	(− 13.74)	+	0.04	21 35 26.17	19 47 57.04	1 47 29.13	(+ 2.08)	.. ..	.....	19 47 57.06	.....
	152	c	Sagittarii		10.3	29.8	49.2	08.4	27.6	47.3	06.6	21 41 08.46				21 41 07.73	19 53 38.59	1 47 29.14		.....	.....	.....	.....
	153	a^2	Capricorni		32.5	49.8	07.4	24.8	42.6	59.7	17.7	21 57 24.92				21 57 24.44	20 09 55.39	1 47 29.05		.....	.....	.....	.....
10(	154	b	Sagittarii	W.	30.6	.....	.....	28.4	47.8	07.3	26.3	21 35 26.65	− 1.50	−	0.37	21 35 27.65	19 47 57.02	1 47 29.63	47 31.14	.....	.....	.....	.....
	155	c	Sagittarii		11.5	31.3	50.6	09.8	29.3	48.7	08.2	21 41 09.91	(− 13.28)	+	0 20	21 41 09.00	19 53 38.57	1 47 30.43	(+ 2.53)	.....	.....	.....	.....
	156	a^2	Capricorni		34.3	51.8	09.0	26.9	44.4	01.8	19.3	21 57 26.79			1.50	21 57 26.20	20 09 55.38	1 47 30.82		.....	.....	.....	.....
	157	j	Moon's 1st limb.		20.8	40.8	59.3	18.6	38.0	56.9	15.3	22 24 16.53			1.92	22 24 17.85	20 21 37.14	.....	.....	1 11.49	.....	20 21 36.54	6 28 40.56
12h	158	δ	Capricorni	E.	41.6	59.4	17.3	34.8	52.7	10.6	28.6	23 26 35.00	+ 1.50	+	1.65	23 26 34.58	21 38 57.47	1 47 37.11	47 37.76	.....	.....	.....	.....
	159	μ	Capricorni		03.5	21.2	38.7	56.3	14.0	31.6	49.4	23 32 56.39	(− 12.82)		1.43	23 32 56.01	21 45 18.82	1 47 37.19	(+ 3.07)	.....	.....	.....	.....
	160	α	Gruis		21.8	46.9	12.5	37.7	03.6	28.8	54.8	23 46 38.01	+ 1.01			23 46 36.97	21 58 59.87	1 47 37.10		.....	.....	.....	.....
	161		G. C. 1993		52.3	09.8	26.8	44.0	01.3	18.5	36.2	23 56 44.13			0.68	23 56 43.77	22 09 06.65	1 47 37.12		.....	.....	.....	c 6 28 24.11
	162		Moon's 1st limb.		16.8	34.5	52.3	10.6	28.7	46.8	05.1	0 17 10.69			0.68	0 17 10.24	22 16 21.30	.....		1 06.84	22 27.06	22 16 20.66	e 6 28 24.96
	163	ξ	Pegasi		55.6	12.8	30.0	47.5	04.8	22.3	39.4	0 21 47.49			0.68	0 21 47.39	22 34 10.05	1 47 37.34		.....	.....	.....	.....
	164	τ^4	Aquarii		35.6	53.4	10.7	28.3	46.2	03.8	21.3	0 29 28.47			0.68	0 29 28 05	22 41 50.49	1 47 37.56		.....	22 41 50.70	.....	.....
	165	δ	Aquarii		37.3	55.5	13.1	30.9	48.8	06.3	24.4	0 34 30.90			0.68	0 34 30.44	22 46 53.00	1 47 37.44		.....	22 46 53.03	.....	.....
	166	α	Piscis Australis		12.2	32.3	52.0	11.8	31.5	51.3	11.4	0 37 11.79			0.68	0 37 11.12	22 49 33.70	1 47 37.42		.....	.....	.....	.....
	167	α	Pegasi		13.3	30.8	48.4	06.0	23.6	41.3	59.3	0 45 06.10		+	0.68	0 45 06.07	22 57 28.71	1 47 37.36		.....	.....	.....	.....
13	168	τ^4	Aquarii	W.	38.8	56.3	13.6	31.5	49.3	07.0	24.4	0 29 31.56	− 1.50	+	0.27	0 29 31.06	22 41 50.48	1 47 40.58	47 40.59	.....	.....	.....	.....
	169	δ	Aquarii		40.5	58.3	15.2	34.3	51.9	09.6	27.3	0 34 34.01	(− 9.28)		0.27	0 34 33.48	22 46 52.99	1 47 40.49	(+ 2.70)	.....	22 46 53.19	.....	.....
	170	α	Piscis Australis		15.4	35.6	54.8	15.1	34.7	54.4	14.3	0 37 14.90			0.27	0 37 14.21	22 49 33.70	1 47 40.51		.....	.....	.....	.....
	171	α	Pegasi		16.3	34.4	51.6	09.6	27.0	44.8	02.3	0 45 09.43		+	0 27	0 45 09.22	22 57 28.71	1 47 40.51		.....	.....	.....	.....

a Fleecy clouds were flying over during the observations.
b The perfect limb.
c Deduced from corresponding observations made at Greenwich Observatory.
d 64.77s. = computed time of moon's semi-diam. passed meridian.
e Deduced from observations made at Philadelphia High School Academy.
f Clouds have prevented a full set of observations to-night.
g No low star could be taken in consequence of the clouds.
h 62.81 = computed time of moon's semi-diam. passing meridian.
i Clouds prevent further observations.
j Very cloudy.
k Clouds and rain prevent observations being made bright.
l 66.98s. = computed time of moon's semi-diam. passing meridian.

Meridian transit observations made at mouth of Rio Grande, &c.—Continued.

Date.	Number for reference.	Name of object.	Illuminated end of axis.	Seconds of transit over the seven wires. I.	II.	III.	IV.	V.	VI.	VII.	Concluded transit over the mean of the seven wires.	Error of— Collima'n, (azimuth.)	Level.	Corrected transit.	Tabular right ascension of known stars and moon's centre.	Chronometer apparently fast of sidereal time.	Adopted chronometer fast at 0h. sidereal time and (gaining rate.)	Sidereal time of semidiam. passing meridian of station.	App. R. A. of centre deduced from observations made at— High School Observatory, Phila.	Royal Observatory, Gr'nwich.	Long. west of Greenwich deduced from observations of each night.
1853.				s.	s.	s.	s.	s.	s.	s.	h. m. s.	"	"	h. m. s.	h. m. s.	h. m. s.	m s.	m. s.	h. m. s.	h. m. s.	h. m. s.
Oct. 13	172	G. C. 2086	W.	34.2	51.4	08.3	25.7	43.2	00.3	17.3	0 54 25.77	— 1.50	+ 0.27	0 54 25.35	23 06 44.90	1 47 40.45	47 40.59				
	173	G. C. 2092		09.8	27.3	44.6	02.3	19.3	36.5	54.2	0 59 02.00	(— 9.28)	0.47	0 59 01.55	23 11 21.17	1 47 40.36	(+ 2.70)				a6 28 20.87
	174	Moon's 1st limb		28.6	46.3	04.4	21.8	39.3	56.7	14.9	1 08 21.71		0.89	1 08 21.98	23 08 16.56			1 04.80	22 18 43.58	23 08 15.90	c6 28 28.00
	175	20 Piscium		15.2	32.4	49.1	06.3	23.6	40.8	57.7	1 28 06.44		0.89	1 28 06.08	23 40 25.49	1 47 40.59			23 40 25.43		
	176	27 Piscium		00.8	18.2	35.0	52.3	09.6	26.3	43.5	1 38 52.94		0.89	1 38 51.88	23 51 11.25	1 47 40.63			23 51 11.21		
	177	G. C. 2153		40.3	57.8	14.8	32.2	49.3	06.4	23.5	1 45 32.04		+ 0.89	1 45 31.60	23 57 51 21	1 47 40.39					
17d	178	α Eridani	E.	32.5	04.8	36.4	09.3	.....	.....	.....	3 20 08.83	+ 1.50	— 0.55	3 20 08.63	1 32 17.71	1 47 50.92	47 50.86				
	179	α Piscium		29.2	46.3	03.4	20.2	37.3	54.3	11.6	3 42 20.34	(— 3.90)	+ 1.38	3 42 20.41	1 54 29.46	1 47 50.95	(+ 2.56)		1 54 29.38		
	180	ζ¹ Ceti		14.7	31.9	49.0	06.6	23.8	41.1	58.3	3 53 06.49		2.39	3 53 06.66	2 05 15.56	1 47 51.10			2 05 15.47		a6 28 25.89
	181	Moon's 2d limb		01.6	19.3	36.8	54.8	12.7	30.2	47.9	4 19 54.76		2.39	4 19 54.95	2 18 17.81			1 03.10	e2 28 07.46	2 18 17.07	e6 28 34.37
	182	B. A. C. 845		01.8	19.3	36.6	53.6	11.0	28.3	45.0	4 24 53.77		1.88	4 24 53.91	2 37 02.71	1 47 51.20			2 37 02.75	2 37 02.71	
	183f	π Arietis		06.0	23.5	41.8	59.7	17.3	34.8	53.3	4 28 59.49		1.50	4 28 59.65	2 41 08.44	1 47 51.21					
	184	α Ceti		38.5	55.4	12.3	29.5	46.8	03.9	20.8	4 42 29.60		1.50	4 42 29.69	2 54 38.56	1 47 51.13					
	185	G. C. 274		44.6	04.3	23.8	43.8	03.3	22.8	42.6	4 53 43.60		+ 0.28	4 53 43.47	3 05 59.32	1 47 51.15					
18	186	B. A. C. 845	W.	04.6	22.2	39.3	56.7	13.9	31.3	48.5	4 24 56.79	— 1.50	+ 0.27	4 24 56.52	2 37 02.72	1 47 53.80	47 53.42			2 37 02.72	
	187	π Arietis		08.6	26.6	44.3	02.3	20.3	38.1	55.8	4 29 02.31	(— 9.08)	0.44	4 29 02.14	2 41 08.46	1 47 53.68	(+ 2.88)		2 41 08.44		a6 28 20.6
	188	Moon's 2d limb		01.3	19.2	36.8	55.3	13.4	31.5	49.3	5 07 55.26		2.06	5 07 55.20	3 05 54.03	.....		1 04.06	g3 15 59.50	3 05 53.98	c6 28 24.09
	189	η Tauri		46.0	04.4	22.6	41.8	00.5	18.8	37.7	5 26 41.69		2.06	5 26 41.70	3 38 47.99	1 47 53.71				3 38 48 03	
	190	32 Tauri		12.3	31.3	49.5	07.8	26.3	44.8	03.2	5 36 07.89		1.55	5 36 07.94	3 48 14.10	1 47 53.84			3 48 13.97		
	191	γ¹ Eridani		14.2	31.8	49.3	06.8	24.0	42.3	59.6	5 39 06.94		1.38	5 39 06.51	3 51 12.71	1 47 53.80					
	192	G. C. 344		02.3	20.4	38.6	57.2	15.8	33.8	52.1	5 43 57.17		1.10	5 43 57.09	3 56 03.35	1 47 53.74					
	193	G. C. 362		29.4	47.4	04.5	22.3	40.3	57.8	15.7	5 59 22.49		+ 1.10	5 59 22.34	4 11 28.51	1 47 53.83					
19	194	η Tauri	E.	49.3	07.8	26.4	45.3	03.7	22.5	41.3	5 26 45.19	+ 1.50	— 0 41	5 26 45.94	3 38 48.01	1 47 57.93	47 56.62		3 38 48.16	3 38 48.05	
	195	32 Tauri		16.0	34.3	52.6	11.4	29.6	48.2	06.5	5 36 11.23	(— 13.24)	+ 0.09	5 36 11.28	3 48 14.13	1 47 57.15	(+ 3.30)		3 48 14.05		
	196	γ¹ Eridani		17.6	35.1	52.5	10.3	27.7	45.4	03.3	5 39 10.27		0.96	5 39 09.80	3 51 12.73	1 47 57.07					
	197	G. C. 344		05.3	23.8	42.2	00.4	19.0	37.4	55.8	5 44 00.56		0.55	5 44 00.61	3 56 03.38	1 47 57.26					a6 28 24.86
	198	Moon's 2d limb		34.6	53.2	11.6	30.5	49.3	07.5	26.3	5 57 30.43		0.55	5 57 30.49	4 08 56.86	.....		1 05.32	h4 05 23.77	3 54 56.38	e6 28 27 56
	199	G. C. 363		18.2	38.5	59.3	20.2	40.4	01.3	22.3	6 00 20.03		0.68	6 00 19.25	4 12 22.01	1 47 57.24					
	200	G. C. 370		35.5	53.6	12.3	30.8	49.3	07.7	26.4	6 05 30.80		0.91	6 05 30.92	4 17 33.75	1 47 57.17					
	201	Tauri		35.6	53.5	11.3	29.0	46.8	04.4	22.3	6 15 28.99		1.37	6 15 29.02	4 27 31.95	1 47 57.07			4 27 31.95		
	202	G. C. 400		29.8	48.3	06.8	25.2	43.7	02.3	20.9	6 21 25.29		+ 1.65	6 21 25.47	4 33 28.25	1 47 57.22					
20	203	θ¹ Tauri	W.	28.7	44.5	02.3	20.2	37.6	55.5	13.0	6 08 19.04	— 1.50	+ 0.55	6 08 19.80	4 20 19.05	1 48 00.75	48 00.03				

	204	α	Tauri		39.3	57.6	14.9	33.2	50.6	08.3	26.5	6 15 52.91	(− 6.43)	1.30	6 15 39.69	4 27 31.97	1 48 00.85	(+ 3.46)				
	205		G. C. 402		33.3	52.3	10.4	29.3	47.8	06.3	24.8	6 21 29.17		0.13	6 21 29.16	4 33 28.98	1 48 00.86					
	206		G. C. 405		56.0	14.3	31.8	50.1	08.0	26.0	44.3	6 40 50.07		2.75	6 30 50.11	4 42 49.32	1 48 00.71					
	207		Moon's 2d limb.		.....	16.8	34.8	54.3	13.3	32.2	51.3	6 48 54.41		1.65	6 48 54.34	4 45 45.58	.....		1 06.59	.....	4 45 45.37	6 28 42.03
	208	ϵ	Tauri		56.7	15.2	33.4	52.0	10.3	28.6	47.3	7 06 51.93		1.65	7 06 51.81	5 18 51.05	1 48 00.76					
	209	α	Leporis		24.4	42.6	00.3	18.3	36.3	54.2	12.2	7 14 18.33		1.92	7 14 18.01	5 26 16.93	1 48 01.08					
	210	ζ	Tauri		00.3	18.5	36.4	55.3	13.6	31.8	49.9	7 16 55.11		2.04	7 16 55.16	5 28 54.19	1 48 00.91					
	211		G. C. 493		07 2	25.6	44.4	03.3	22.1	40.5	59.4	7 28 03.21		+ 2.47	7 28 03.27	5 40 02.34	1 48 00.93					
421	212	ϵ	Tauri	E.	.....	18.3	36.8	55.3	13.8	32.4	50.6	7 06 55.28	+ 1.50	− 0.55	7 06 55.15	5 18 51.08	.....	48 03.55	... .			
	213	α	Leporis		27.8	46.2	03.6	21.6	39.7	57.8	15.8	7 14 21.79	(− 12.68)	+ 0.18	7 14 21.98	5 26 16.96	1 48 04.32	(+ 3.68)				
	214	ζ	Tauri		.....	22.0	40.1	58.3	16.8	35.2	53.5	7 16 58.48		0.50	7 16 58.60	5 28 54.22	1 48 04.38					
	215		Moon's 2d limb.		00.6	19.7	38.5	57.8	.....	36.6	.....	7 41 57.94		+ 0.68	7 41 58.10	5 38 19.40	.....		1 07.66	.....	5 38 19.19	6 28 41.25
22	216	α	Columbæ	W.	28.5	49.3	09.6	30.3	50.8	11.7	31.8	7 22 30.29	− 1.50	+ 1.93	7 22 29.99	5 34 21.67	1 48 08.32	48 07.40	....			
	217	α	Orionis		31.6	49.3	06.2	23.3	41.0	57.8	15.3	7 35 23.50	(− 3.31)	1.23	7 35 23.41	5 47 15.08	1 48 08.33	(+ 3.75)				
	218	η	Geminorum		15.6	34.3	52.3	11.3	29.4	47.8	08.4	7 54 11.01		1.23	7 54 10.98	6 06 02.48	1 48 08.50					
	219	μ	Geminorum		19.3	37.5	56.3	14.7	33.3	52.0	10.2	8 02 14.76		2.10	8 02 14.79	6 14 06.34	1 48 08.45					
	220		G. C. 587		07.2	26.3	44.6	03.8	22.8	41.8	00.4	8 23 03.84		2.10	8 23 03.88	6 34 55.49	1 48 08 39					
	221		Moon's 2d limb.		17.2	36.7	55.5	14.8	34.3	53.9	13.0	8 36 15.06		2.71	8 36 15.15	6 32 15.86	.....		1 08.28	.....	6 32 15.65	6 28 11.11
	222	ζ	Geminorum		38.6	57.2	15.6	32.7	52.3	10.3	28.5	8 43 33 74		+ 3.02	8 43 33.82	6 55 25.38	1 48 08.44					
Nov. 7	223	ρ	Capricorni	E.	41.6	59.5	17.3	35.5	53.6	11.3	.....	22 09 35.38	+ 1.50	+ 0.40	22 09 34.92	20 20 29.59	1 49 05.33	49 05.87	.....			
	224	ψ	Capricorni		34.2	52.8	11.8	30.8	50.0	08.6	27.8	22 26 30.86	(− 13.23)	+ 0.40	22 26 30.22	20 37 24.64	1 49 05.58	(+ 3.57)	....		20 37 24.60	..... .
	225	ζ	Cygni		48.6	07.8	27.5	47.3	07.3	26.5	46.3	22 55 47.33		− 0.11	22 55 47.36	21 06 42.01	1 49 05.35		.....			
	226		Moon's 1st limb.		03.6	23.3	41.0	59.8	18.8	37.5	56.3	23 06 59.90		0.27	23 06 59.31	21 03 15.90	.....		1 10.61	.....	21 03 14.68	a6 28 36.94
	227	δ	Capricorni		09.8	27.6	45.2	03.3	21.0	38.8	56.8	23 28 03.21		0.27	23 28 02.68	21 38 57.11	1 49 05.57		.....	.....	21 38 57.21	.....
	228	μ	Capricorni		31.7	49.3	06.8	24.5	42.3	59.6	17.5	22 34 24.53		0.27	23 34 24.04	21 45 18.47	1 49 05.57		.....	.....	21 45 18.52	.....
	229	α	Gruis		49.8	15.3	40.5	05.6	31.3	56.6	22.0	23 48 05.67		− 0.27	23 48 04.74	21 58 59.34	1 49 05.40		.....	.....	.....	.....
8	230	δ	Capricorni	W.	13.2	31.3	48.6	06.8	24.6	42.3	00.3	23 28 06.73	− 1.50	+ 0.27	23 28 06.23	21 38 57.09	1 49 09.14	49 09.37	.....	21 38 57.36	21 38 57.19	.....
	231	μ	Capricorni		35.2	53.0	10.2	28.0	45.7	03.3	20.8	23 34 28.03	(− 8.81)	+ 0.19	23 34 27.55	21 45 18.46	1 49 09.09	(+ 3.74)	.....	21 45 18.70	21 45 18.51	... .
	232	α	Gruis		52.8	18.8	43.8	09.3	34.5	00.3	24.8	23 48 09.19		.....	23 48 08.21	21 58 59.34	1 49 08.87		.....	.....	.....	a6 28 34.05
	233		Moon's 1st limb		59.8	17.8	36.3	54.5	12.8	31.0	48.8	0 02 54.43		.....	0 02 53.92	22 00 15.98	.....		1 07.75	22 00 36.29	22 00 14.81	j6 28 34.53
	234	σ	Aquarii		11.3	28.8	46.3	03.5	20.7	38.5	55.8	0 12 03.56		+ 0.11	0 12 03.11	22 22 53.79	1 49 09.32		.....	22 22 53.69	22 22 53.84	.....
	235	ζ	Pegasi		27.0	44.6	01.8	19.3	36.7	53.3	11.3	0 23 19.14		0.27	0 23 18.89	22 34 09.76	1 49 09.13		.....	.....	.....	.....
	236	δ	Aquarii		08 8	26.8	44.3	02.2	20.6	38.0	55.8	0 36 02.36		0.27	0 36 01.86	22 46 52.73	1 49 09.13		.....	22 46 52.87	22 46 52.81	.....
	237	α	Piscis Australis		43.8	03.8	23.0	43.3	03.0	22.6	42.5	0 38 43.14		0.77	0 38 42.50	22 49 33.39	1 49 09.11		.....	.....	.....	.....
	238	α	Pegasi		44.3	02.3	19.8	37.6	55.4	12.8	30.3	0 46 37.50		+ 2.06	0 46 37.42	22 57 28.46	1 49 08.96		.....	.....	.....	.....
9	239	σ	Aquarii	E.	14.6	32.3	49.4	06.8	24.3	41.5	59.3	0 12 06.89	+ 1.50	.....	0 12 06.86	22 22 53.78	1 49 13.08	49 13.35	.....	22 22 53.68	22 22 53.83	.....
	240	ζ	Pegasi		30.8	48 3	05.5	22.8	40.3	57.3	14.9	0 23 22.84	(− 3.09)	− 0.20	0 23 22.87	22 34 09.75	1 49 13.12	(+ 4.17)	.....	.....	.....	.....
	241	δ	Aquarii		12.3	30.3	48.2	05.8	23.8	41.5	59.6	0 36 05.93		− 0.47	0 36 05.86	22 46 52.71	1 49 13.15		.....	22 46 52.76	22 46 52.79	.....

a Deduced from corresponding observations made at Greenwich Observatory.
c Deduced from corresponding observations made at Philadelphia High School Observatory.
e 63s.95. = computed time of moon's semi-diam. passing meridian.
g 64s.90. = computed time of moon's semi-diam. passing meridian.
i No further observations this morning, in consequence of the thickening clouds.

b 64s.90. = computed time of moon's semi-diam. passing meridian.
d Oct. 16.—Clouds prevent observations being made to-night.
f Not satisfactory, because of clouds.
h 65s.94. = computed time of moon's semi-diam. passing meridian.
j Deduced from corresponding observations made at Radcliffe Observatory

Meridian transit observations made at mouth of Rio Grande, &c.—Continued:

Date.	No. or reference.	Name of object.	Illuminated end of axis.	Seconds of transit over the seven wires. I.	II.	III.	IV.	V.	VI.	VII.	Concluded transit over the mean of the seven wires.	Error of— Collima'n, (azimuth.)	Level.	Corrected transit.	Tabular right ascension of known stars and moon's centre.	Chronometer apparently fast of sider'l time.	Adopted chronometer fast at 0h. sider'l time and (gaining rate.)	Sidereal time of semidiam. passing meridian of station.	App. R. A. of centre deduced from observations made at— High School Observatory, Phila.	Royal Observatory, Gr'nwich.	Long. west of Greenwich deduced from observations of each night.
1853.				s.	s.	s.	s.	s.	s.	s.	h. m. s.	"	"	h. m. s.	h. m. s.	h. m. s.	m. s.	m. s.	h. m. s.	h. m. s.	h. m. s.
Nov. 9	242	α Piscis Australis.	E.	47.3	06.8	26.5	46.6	06.3	26.0	46.3	0 38 46.54	+ 1.50	− 0.52	0 38 46.43	22 49 33.37	1 49 13.06	49 13.35	.....	.....	.....	.....
	243	α Pegasi.....		48.5	06.2	23.6	41.3	59.0	16.8	34.4	0 46 41.40	(− 3.09)	0.68	0 46 41.41	22 57 28.45	1 49 12.96	(+ 4.17)	.....	.....	.....	α6 28 32.15
	244	Moon's 1st limb		54.7	12.3	30.3	48.2	06.3	23.5	41.3	0 54 48.09		0.68	0 51 48.02	22 53 03.22	.....		1 05.53	22 53 13.08	22 53 02.20	6 28 30.50
	245	ϕ Aquarii.....		.....	.....	.....	.....	15.3	32.3	49.5	0 55 57.87		0.84	0 55 57.87	23 06 44.69	1 49 13.18		.....	23 06 44.49	23 06 44.54	.....
	246	ψ^5 Aquarii		42.3	59.4	16.8	34.5	51.8	09.0	26.6	1 00 34.34		− 1.65	1 00 34.23	23 11 20.85	1 49 13 38		.....	23 11 21.12	23 11 20.97	.....
10	247	ξ Pegasi.....	W.	35.0	52.6	09.8	27.5	44.8	01.8	19.4	0 23 27.27	− 1.50	+ 1 00	0 23 27.12	22 34 09.73	1 49 17.39	49 17.72	.....	.....	.....	.....
	248	α Piscis Australis.		51.6	12.2	31.5	51.6	11.3	31.3	50.8	0 38 51.47	(− 6.24)	1.00	0 38 51.01	22 49 33.36	1 49 17.65	(+ 4.15)	.....	.....	.....	.....
	249	α Pegasi.....		53.3	10.8	28.3	46.3	03.8	21.4	38.9	0 46 46.11		0.57	0 46 46.03	22 57 28.43	1 49 17.60		.....	.....	.....	.....
	250	ϕ Aquarii.....		10.6	28.3	45.0	02.6	19.8	36.8	53.9	0 56 02.43		0.00	0 56 02.21	23 06 44.66	1 49 17.53		.....	23 06 44.49	23 06 44.74	.....
	251	ψ^5 Aquarii.....		46.5	03.8	21.4	38.5	56.3	13.3	30.8	1 00 38.66		0.82	1 00 38.41	23 11 20.84	1 49 17.57		.....	23 11 21.09	23 11 20.97	.....
	4252	27 Piscium.....		37.5	54.8	.....	.....	46.3	03.3	.....	1 40 29.10		0.82	1 40 28.91	23 51 11.10	1 49 17.81		.....	23 51 11.29	23 51 11.13	α6 28 26.23
	253	Moon's 1st limb.		47.9	05.8	23.2	40 7	58.3	15.6	33.3	1 43 40.69		1.18	1 43 40.47	23 42 31.72	.....		1 03.57	23 42 41.18	23 42 31.11	c6 28 31.07
	4254	33 Piscium.....		17.3	34.5	.....	09.0	.....	.....	.....	1 47 08.95		+ 1.65	1 47 08.73	23 57 50.98	1 49 17.75		.....	23 57 51.04	23 57 50.99	.....
11	255	27 Piscium.....	E.	41.7	59.0	.....	32.8	50.6	07.4	24.8	1 40 33.34	+ 1v50	− 0.27	1 40 32.94	23 51 11.09	1 49 21.85	49 21.65	.....	23 51 11.28	23 51 11.12	.....
	256	33 Piscium.....		21.5	38.8	55.8	13.3	30.3	47.3	04.8	1 47 13.11	(− 16,22)	0.66	1 47 12.59	23 57 50.97	1 49 21.62	(+ 4.20)	.....	23 57 51.03	23 57 50.98	.....
	257	Andromedæ		13.6	32.9	52.3	11.7	31.3	50.6	10.0	1 50 11.77		0.82	1 50 11.77	0 00 50.18	1 49 21.59		.....	.....	.....	.....
	258	β Ceti.....		43.3	01.3	19.3	37.2	55.4	13.5	31.8	2 25 37.40		0.82	2 25 36.65	0 36 15.03	1 49 21.62		.....	.....	.....	.....
	259	Moon's 1st limb.		45.8	03.0	20.5	37.6	55.3	12.4	29.8	2 30 37.77		1.27	2 30 37.31	0 29 47.74	.....		1 02.56	0 29 56.95	0 29 47.14	α6 28 23.32
	260	30 Ceti.....		03.3	20.5	37.4	54.8	11.2	28.6	46.2	2 34 54.66		− 1.65	2 34 54.16	0 45 32.32	1 49 21.84		.....	0 45 32.36	0 45 32.38	.....
12	261	λ Piscium.....	W.	41.0	58.3	15.5	32.8	50.2	07.3	24.0	2 30 32.73	− 1.50	− 0.27	2 30 33.38	0 41 06.05	1 49 26.33	49 26.13	.....	0 41 06.00	0 41 05.96	.....
	262	20 Ceti.....		07.8	24.8	41.6	59.3	16.3	33.3	50.2	2 34 59.04	(− 6.69)	1.06	2 34 58.67	0 45 32.31	1 49 26.36	(+ 4.30)	.....	0 45 32.37	0 45 32.37	.....
	263	G. C. 66		56.6	14.2	30.9	48.3	05.4	22.8	40.3	2 44 48.36		3.02	2 44 47.96	0 55 21.67	1 49 26.25		.....	0 55 21.70	0 55 21.70	.....
	264	G. C. 121		07.3	24.3	41.3	58.8	15.8	32.9	50.0	3 11 58.63		2.48	3 11 58.32	1 22 31.85	1 49 26.37		.....	1 22 31.83	1 22 31.89	.....
	265	Moon's 1st limb.		23.2	10.4	28.0	45.3	03.3	20.3	37.6	3 16 45.44		2.11	3 16 45.05	1 15 57.47	.....		1 02.96	.....	1 15 56.83	α6 28 34.55
	266	α Eridani.....		07.8	40.6	12.5	45.3	16.8	49.3	21.4	3 21 44.81		1.66	3 21 43.76	1 39 17.16	1 49 26.60		.....	.....	.....	.....
	267	o Piscium		15.5	33.0	50.2	07.6	24.8	41.8	59.3	3 27 07.46		− 1.10	3 27 07.15	1 37 40.93	1 49 26 62		.....	1 37 40.84	1 37 41.06	.....
13	268	ν Piscium.....	E.	28.9	46.3	03.4	20.3	37.8	54.8	12.2	3 23 20.53	+ 1.50	− 1.10	3 23 20.32	1 33 49.77	1 49 30.55	49 30.25	.....	.....	1 33 49.80	.....
	269	o Piscium.....		19.6	37.3	54.3	11.5	29.0	46.3	03.6	3 27 11.66	(− 6.20)	2.20	3 27 11.49	1 37 40 93	1 49 30.56	(+ 3.88)	.....	1 37 40.84	1 37 41.06	....
	270	Moon's 1st limb.		06.3	25.8	43.6	00.8	18.8	36.4	53.9	4 03 01.09		3.08	4 03 00.87	2 02 01.52	.....		1 02.62	.....	2 02 00.64	α6 28 35.93
	271	ξ^2 Ceti.....		03.2	20.3	37.3	54.8	11.8	29.3	46.6	4 09 54.76		3.85	4 09 54.48	2 20 23.85	1 49 30.63		.....	2 20 23.75	2 20 23.80	.....
	272	B. A. C. 845.....		49.3	59.5	16.4	33.8	51.3	08.5	25.8	4 26 33.94		3.85	4 26 33.68	2 37 02.98	1 49 30.70		... ...	2 37 03.10	2 37 02.95	.....

14	273	ξ^{a} Ceti	W.	06.3	23.8	40.9	58.3	15.6	32.8	50.0	4 09 58.54	− 1.50	− 0.89	4 09 56.27	2 20 23.85	1 49 34.42	49 33.89	.....	2 20 23.75	2 20 23.80	.....
	274	B. A. C. 845		45.8	03.3	20.3	37.5	55.2	12.3	29.6	4 26 37.71	(− 5.71)	1.98	4 26 37.38	2 37 02.98	1 49 34.40	(+ 4.08)	.....	2 37 03.10	2 37 02.95	.....
	275	G. C. 244		49.6	07.7	25.3	43.3	01 4	19.0	36.8	4 30 43.30		2.25	4 30 42.99	2 41 08.80	1 49 34.19		.....	2 41 08.75	2 41 08.75	....
	276	G. C. 254		31.5	50.2	08.2	26.6	44.8	03.3	21.4	4 40 26.57		2.88	4 40 26.23	2 50 51.99	1 49 34.24		.....	.....	2 50 51.96	a 6 28 33.60
	d277	Moon's 1st limb		20.3	38.3	56.3	14.3	32.5	50.2	08 3	4 50 14.31		2.88	4 50 13.96	2 48 52 10	.....		1 03.50	2 49 01.40	2 48 51.37	c 6 28 30.44
	278	Moon's 2d limb		27.6	45.5	03.4	21.8	39.4	57.3	15.3	4 52 21.47		2.75	4 52 21.11	2 48 59.10	.....		1 03.50	.....	.....	.....
	279	G. C. 274		28.8	48.3	07.5	27.5	47.2	06.8	26.3	4 55 27.49		2.54	4 55 26.90	3 05 59.63	1 49 34.27		.....	.....	.....	.....
	280	τ^{1} Ariet s		27.8	46.0	04.2	22.4	40.8	58.9	.....	5 02 22.54		− 2.06	5 02 22.25	3 12 47 93	1 49 34.32		.....	3 12 47.99	3 12 48.01	.....
15	281	G. C. 274	E.	33.3	52.8	12.5	32.3	51.8	11.6	31.0	4 55 32.19	+ 1.50	− 1.92	4 55 31.50	3 05 59.63	1 49 38.87	49 38.41	.....	.....	.....	.....
	282	τ^{1} Arietis		32.4	50.7	08 8	26.9	45.3	03.5	22.2	5 02 27.11	(− 11.22)	1.92	5 02 27.01	3 12 47.94	1 49 39.07	(+ 4.76)	.....	3 12 48.00	3 12 48.02	.....
	283	η Tauri		31.6	50.3	08.8	27.4	46.3	04.8	23.3	5 28 27.50		1.92	5 28 27.45	3 38 48.33	1 49 39.19		.....	3 38 48.48	3 38 48.46	.....
	284	Moon's 2d limb		18.3	36.5	55.2	13.3	31.8	50.2	08.6	5 41 13.43		2.80	5 41 13.25	3 37 09.67	.....		1 04.67	.....	3 37 08.66	a 6 28 28.41
	285	G. C. 344		48.2	06.4	24.5	43.0	01.6	19.8	38.5	5 45 43.14		3 02	5 45 42.97	3 56 03.88	1 49 39.09		.....	.....	.....	.....
	286	γ Tauri		15.5	33.3	50.4	08.3	26.3	43.8	01.6	6 01 08.46		3.02	6 01 08.20	4 11 29.14	1 49 39.06		.....	.....	4 11 28.95	....
	287	δ^{a} Tauri		26.6	44.4	02.0	19.8	37.8	55.6	13.5	6 05 19.94		− 2.97	6 05 19.71	4 15 [illegible].75	1 49 38.96		.....	4 15 40.70	4 15 40.69	....
e16	288	δ^{a} Tauri	W.	.....	.....	.....	25.3	43.3	01.0	18.6	6 05 25.30	− 1.50	+ 0.55	6 05 25.05	4 15 40.77	1 49 44.28	49 43.41	.....	4 15 40.72	4 15 40.71	.....
	289	G. C. 370		.....	.....	00.3	18.8	37.3	.....	14.3	6 07 18.90	(− 11.00)	+ 0.55	6 07 18.73	4 17 34.33	1 49 44.40	(+ 5.30)	.....	.....	....	.....
18	290	a Columbæ	E.	17.0	37.8	58.3	18.8	39.5	00.3	21.2	7 24 18.99	+ 1.50	− 2.20	7 24 18.28	5 34 22.34	1 49 55.94	49 54.61	.....	.....	....	.....
	291	132 Tauri		02.6	21.3	40.3	58.7	17.6	36.3	55.5	7 29 58.90	(− 10.57)	2.20	7 29 58.91	5 40 02.79	1 49 56.05	(+ 5.33)	.....	.....	5 40 02.82	.....
	292	136 Tauri		06.8	26.0	45.3	04.3	23.8	42.8	02.6	7 34 04.51		2.20	7 34 04.43	5 44 08.69	1 49 55.74		.....	.....	5 44 08.69	....
	293	G. C. 535		04.2	22.4	40.8	59.3	18.3	36.3	55.3	7 55 59.51		2.20	7 55 59.42	6 06 03.48	1 49 55.94		.....	.....	6 06 03.36	.....
	294	Moon's 2d limb		38.6	56.3	15.5	34.8	54.4	13.6	33.3	8 18 34.94		3.70	8 18 34.77	6 19 53.80	.....		1 07.95	.....	6 19 53.44	a 6 28 28.67
	295	ϵ Geminorum		55.8	14 8	33 6	52.6	11.5	30.3	49.3	8 24 52.56		3.80	8 24 52.38	6 34 56.36	1 49 56.02		.....	.....	6 34 56.28	.....
	296	a Canis Majoris		45.8	04.0	21.5	39.4	57.3	15.0	32.6	8 28 39.37		3.85	8 28 38.77	6 38 42.71	1 49 56.06		.....	.....	.....	.....
	297	ξ Geminorum		27.9	46.3	04.2	22.6	40.8	59.3	17.5	8 45 22.66		− 3.85	8 45 22.44	6 55 26.22	1 49 56.22		.....	.....	6 55 26.25	.....
f21	298	γ Caneri	W.	05.3	24.3	42.5	01.5	19.6	37.8	56.2	10 25 01.03	− 1.50	− 3.30	10 25 00.63	8 34 48.94	1 50 11.69	50 10.00	.....	....	8 34 48.86	.....
	299	Moon's 2d limb		34.4	53.3	12.0	30.8	49.3	08.2	26.6	11 00 30.66	(− 10.57)	3.30	11 00 30.26	8 54 58.53	.....	(+ 4.94)	1 07.00	.....	8 54 58.29	a 6 28 29.45
	300	λ Leonis		37.9	56.6	15.3	34.3	52.8	11.5	29.8	11 13 34.01		− 4.67	11 13 33.53	9 33 21.76	1 50 11.77		.....	.....	.....	.....
22	301	λ Leonis	E.	42.8	01.6	20.2	38.3	57.3	15.5	34.4	11 13 38.59	+ 1.50	− 2.75	11 13 38.47	9 23 21.80	1 50 16.67	50 14.80	.....	.....	.....	.....
	302	Moon's 2d limb		34.8	53.2	11.6	29.8	48.3	06.3	24.3	11 52 29.76	(− 10.57)	2.75	11 52 29.56	9 47 13.58	.....	(+ 4.80)	1 06.93	.....	9 47 13.17	a 6 28 26.91
	303	γ Leonis		16.3	34.0	52.6	10.8	29.0	47.2	05.5	12 02 10.77		− 4.40	12 02 10.51	10 11 53.58	1 50 16.93		.....	.....	10 11 53.61	.....

a Deduced from corresponding observations made at Greenwich observatory.
b Clouds.
c Deduced from corresponding observations made at Radcliffe observatory.
d No. 277—moon's 1st limb perfect.
e Clouds prevent further observations this night.
f Clouds prevent more observations this night.

TABLE B.

Results of observations made at mouth of Rio Grande for equatorial intervals of 46-inch transit, by Troughton & Simms—illumination east.

Stars observed.	First wire.	Second wire.	Third wire.	Fifth wire.	Sixth wire.	Seventh wire
	s.	s.	s.	s.	s.	s.
α Herculis	50.96	33.97	17.08	17.08	34.17	51.35
γ Draconis	51.07	33.92	17.11	17.11	34.14	51.38
λ Sagittarii	50.99	33.98	16.87	17.19	34.20	51.35
γ Aquilæ	50.92	34.00	17.17	17.22	34.29	51.22
δ Sagittarii	51.29	34.04	17.11	17.11	34.13	51.29
β Capricorni	51.18	34.10	17.27	17.08	34.15	51.13
μ Capricorni	51.08	33.92	16.82	17.11	34.09	51.13
α Pegasi	51.23	33.90	17.00	17.24	33.96	51.38
π Capricorni	51.20	34.19	17.05	17.15	33.96	51.15
ζ Cygni	51.02	33.90	.....	17.38	34.33	51.46
ψ³ Aquarii	51.14	33.93	17.06	17.06	34.08	51.14
β Aquilæ	51.11	33.96	17.20	17.30	34.16	51.51
δ Aquilæ	51.19	34.16	16.98	17.13	34.01	51.34
α Aquilæ	.....	.....	17.22	.....	.....	.....
α² Capricorni	51.01	.....	17.05	17.24	34.10	51.30
α Cygni	51.26	34.08	16.90	17.23	34.29	51.22
61¹ Cygni	51.19	34.11	17.13	.....	34.22	.....
α Cephei	51.16	34.10	17.20	17.13	34.17	51.20
β Cephei	51.20	34.24	17.19	17.19	34.25	51.44
ξ² Aquarii	51.15	34.10	17.14	17.34	34.24	51.20
α Piscis Australis	.....	33.96	16.99	17.19	34.07	51.45
α Persei	.....	34.11	17.27	17.14	34.15	51.38
δ Capricorni	51.21	34.08	17.18	17.18	33.99	51.27
ξ Pegasi	51.15	33.87	.....	17.33	34.17	51.49
20 Ceti	51.17	34.13	17.19	17.34	34.13	51.42
Mean	= 51.13	34.03	17.09	17.19	34.14	51.39

Equatorial intervals of 46-inch transit, by Troughton & Simms—illumination east. (C. N. Thom, computer.)

First wire.	Second wire.	Third wire.	Fifth wire.	Sixth wire.	Seventh wire.
51.13s.	34.03s.	17.09s.	17.19s.	34.14s.	51.39s.
1.7066758	1.5318619	1.2307421	1.2358759	1.5329635	1.7109866

Equatorial reduction to middle wire = −0s.06

Log −0s.06 = −2.7781513

TABLE B—Continued.

Computation of probable error of equatorial interval of each wire from the middle wire of 46-inch transit, by Troughton & Simms—illumination east. (*C. N. Thom, computer.*)

First wire.			Second wire.			Third wire.			Fifth wire.			Sixth wire.			Seventh wire.		
Each result.	Δ(final result — each result.)	Δ².	Each result.	Δ(final result — each result.)	Δ².	Each result.	Δ(final result — each result.)	Δ².	Each result.	Δ(final result — each result.)	Δ².	Each result.	Δ(final result — each result.)	Δ².	Each result.	Δ(final result — each result.)	Δ².
s.	s.	s.	s.	s.	s.	s.	s.	s.	s.	s.	s.	s.	s.	s.	s.	s.	s.
50.96	0.17	0.029	33.97	0.06	0.004	17.08	0.01	0.000	17.08	0.11	0.012	34.17	0.03	0.001	51.35	0.03	0.001
51.07	0.06	0.004	33.92	0.11	0.012	17.11	0.02	0.000	17.11	0.08	0.006	34.14	0.00	0.000	51.38	0.06	0.004
50.99	0.14	0.020	33.98	0.05	0.002	16 87	0.22	0.048	17.19	0.00	0.000	34 20	0.06	0.004	51.35	0.03	0.001
50.92	0.21	0.044	34.00	0.03	0.001	17.17	0.08	0.006	17.22	0.03	0.001	34.20	0.15	0.022	51.22	0.10	0.010
51.29	0.16	0.026	34.04	0.01	0.000	17.11	0.02	0.000	17.11	0.08	0.006	34.13	0.01	0.000	51.29	0.03	0.001
51.18	0.05	0.002	34.10	0.07	0.005	17.27	0.18	0.032	17.08	0.11	0.012	34.15	0.01	0.000	51.13	0.19	0.036
51.08	0.05	0.002	33.92	0.11	0.012	16.82	0.27	0.073	17.11	0.08	0.006	34.02	0.12	0.014	51.13	0.19	0.036
51.23	0.10	0.010	33.90	0.13	0.017	17.00	0.09	0.008	17.94	0.05	0.002	33 96	0.18	0.032	51.38	0.06	0.004
51.20	0.07	0.005	34.19	0.16	0.026	17.05	0.04	0.001	17.15	0.04	0.001	33.98	0.18	0.032	51.15	0.17	0.029
51.02	0.11	0.012	33.90	0.13	0.017	17.06	0.03	0.001	17.38	0.29	0.085	34.33	0.19	0.036	51.46	0.14	0.020
51.14	0.01	0.000	33.93	0.10	0.010	17.20	0.11	0.012	17.06	0.13	0.017	34.08	0.06	0.004	51.14	0.18	0.032
51.11	0.02	0.000	33.96	0.07	0.005	16.98	0.11	0.012	17.30	0.11	0.012	34.16	0.02	0.000	51.51	0.19	0.036
51.19	0.06	0.004	34.16	0.13	0.017	17.22	0.13	0.017	17.13	0.06	0.004	34.01	0.13	0.017	51.34	0.02	0.000
51.01	0.12	0.014	34.06	0.05	0.002	17.05	0.04	0.001	17.24	0.05	0.002	34.10	0.04	0 001	51.30	0.02	0.000
51.06	0.13	0.017	34.11	0.08	0.006	16.90	0.19	0.036	17.23	0.04	0.001	34.29	0.15	0.022	51.22	0.10	0.010
51.12	0.01	0.000	34.10	0.07	0.005	17.13	0.04	0.001	17.13	0.06	0.004	34.22	0.08	0.006	51.39	0.07	0.005
51.16	0.03	0.001	34.24	0.21	0.044	17.20	0.11	0.012	17.19	0.00	0.000	34.17	0.03	0.001	51.44	0.19	0.014
51.20	0.07	0.005	34.10	0.07	0.005	17.19	0.10	0.010	17.34	0.15	0.022	34.25	0.11	0.012	51.20	0.12	0.014
51.15	0.02	0.000	33.98	0.05	0.002	17.14	0.05	0.002	17.19	0.07	0.005	34.24	0.10	0.010	51.45	0.13	0.017
51.21	0.08	0.006	34.11	0.08	0.006	16.99	0.10	0.010	17.14	0.05	0.002	34.07	0.07	0.005	51.38	0.06	0.004
51.15	0.02	0.000	34.08	0.05	0.002	17.27	0.18	0.032	17.18	0.09	0.008	34.15	0.01	0.000	51.27	0.05	0.002
51.17	0.04	0.001	33.87	0.16	0.026	17.18	0.09	0.008	17.33	0.14	0.020	33.99	0.15	0.022	51.49	0.17	0.029
			34.13	0.10	0.010	17.19	0.10	0.010	17.34	0.15	0.022	34.17	0.03	0.001	51.42	0.10	0.010
												34.13	0.01	0.000			
Eq'l int. = 51.13 ± 0.005			Eq'l int. = 34.03 ± 0.005			Eq'l int. = 17.09 ± 0.006			Eq'l int. = 17.19 ± 0.005			Eq'l int. = 34.14 ± 0.005			Eq'l int. = 51.32 ± 0.005		

TABLE C.

Collimation error of 46-inch transit, determined from observations made at the mouth of the Rio Grande, October 27, 28, and 29, 1853—illuminated end of axis east. (*C. N. Thom, computer.*)

Date of observation.	Star observed.	Collimation of middle wire, in time.	Date of observation.	Star observed.	Collimation of middle wire, in time.
1853.		s.	1853.		s.
October 27	β Cephei	0.006	October 28	β Ur. Min	0.150
27	γ Cephei	0.273	29	β Cephei	0.165
27	G. C. 177	0.050	29	G. C. 1967	0.081
27	G. C. 210	0.158	29	G. C. 907	0.086
27	β Ur. Min	0.163	29	G. C. 958	0.357
28	β Cephei	0.079	29	γ Cephei	0.125
28	G. C. 1967	0.090	29	G. C. 997	0 210
28	γ Cephei	0.153	29	G. C. 59	0.179
28	G. C. 997	0.070	29	G. C. 107	0.169
28	G. C. 59	0.134	29	G. C. 177	0.345
28	G. C. 107	0.229	29	G. C. 210	0.083
28	G. C. 177	0.079	29	β Ur. Min	0.480
28	G. C. 210	0.099			

Sum = 25)4.076
Mean collimation of middle wire (in time) = + 0s.163
Do do (in arc) = + 2′.44
Collimation of mean of wires (in time) = + 0s.10
Do do (in arc) = + 1″.50

TABLE C—Continued.

Computation of probable error of collimation of middle wire of 46-inch transit, by Troughton & Simms—illumination east. (C. N. Thom, computer.)

Each result.	Δ final result—each result.	Δ²	Each result.	Δ final result—each result.	Δ²
s.	s.	s.	s.	s.	s.
0.098	0.067	0.004	0.150	0.013	0.000
0.273	0.110	0.012	0.165	0.002	0.000
0.050	0.113	0.013	0.081	0.082	0.007
0.158	0.005	0.000	0.066	0.077	0.006
0.163	0.000	0.000	0.357	0.194	0.038
0.079	0.084	0.007	0.125	0.038	0.001
0.090	0.073	0.005	0.210	0.047	0.002
0.153	0.010	0.000	0.179	0.016	0.000
0.070	0.093	0.008	0.162	0.001	0.000
0.134	0.029	0.001	0.345	0.182	0.033
0.229	0.066	0.004	0.063	0.080	0.006
0.079	0.084	0.007	0.460	0.297	0.088
0.099	0.064	0.003			

Final result..... = + 0s.16
Probable error... = ± 0s.01

TABLE D.

Determination of the value of one division of the level used with the 46-inch transit, (by Troughton & Simms,) from observations made at the mouth of the Rio Grande, August 19, 1853. Micrometer attached to zenith. Telescope No. 4. Val. of one rev. = 43″.82. (C. N. Thom, computer.)

Observation.	North end.	Difference.	South end.	Difference.	Mean.	Micrometer reading.	Difference.	Difference in arc.	Val. of one division.
								″	″
1	59	..	19	..	....	16 59.0			
		44		44	44.0	.....	1 05.5	46.23	1.051
	15	..	63	..	....	15 46.5			
2	51	..	25	..	....	15 59.3			
		36		35	35.5	.....	0 83.7	36.68	1.033
	15	..	60	..	....	16 43.0			
3	53	..	21	..	....	16 36.5			
		40		39	39.5	.....	0 98.0	42.94	1.087
	13	..	60	..	....	15 38.5			
4	52	..	49	..	....	12 88.5			
		29		30	29.5	.....	0 71.5	31.33	1.062
	51	..	19	..	....	13 60.0			
5	51	..	19	..	....	13 60.0			
		39		38.5	38.75	.....	0 97.0	42.50	1.097
	13	..	57.5	..	....	12 63.0			
6	19	..	57.5	..	....	13 63.0			
		36		36.5	36.25	.....	0 87.5	38.34	1.058
	48	..	21.0	..	....	13 50.5			

Sum ..... = 6).368
Mean value of one division..... = 1″.063

TABLE E.

Table of corrections for errors of collimation, level, and azimuth, at astronomical station near mouth of Rio Grande. (C. N. Thom, computer.)

LATITUDE = 25° 57'.

[NOTE.—In the following tables the decimal fractions are to be multiplied by every *second of arc*, the result being the correction in *time* to be applied to stars having north polar distances corresponding to those in these tables.]

N. P. D.	Z. dist.	COLLIM'N FOR 1″.	LEVEL FOR 1″.	AZIMUTH FOR 1″.	N. P. D.	Z. dist.	COLLIM'N FOR 1″.	LEVEL FOR 1″.	AZIMUTH FOR 1″.
		1	cos Z. dist.	Sin Z. dist.			1	cos Z. dist.	sin Z. dist.
		15 sin N. P. D.	15 sin N. P. D.	15 sin N. P. D.			15 sin N. P. D.	15 sin N. P. D.	15 sin N. P. D.
° sub.-polo ..	° ′				° sub.-polo.	° ′			
25	89 03	0.158	0.0026	0.158	34	30 03	0.119	0.103	0.060
24	88 03	0.164	0.0056	0.164	35	29 03	0.116	0.102	0.056
23	87 03	0.170	0.0088	0.170	36	28 03	0.113	0.100	0.053
22	86 03	0.178	0.0109	0.177	37	27 03	0.111	0.099	0.050
21	85 03	0.186	0.0160	0.185	38	26 03	0.108	0.097	0.047
20	84 03	0.195	0.0209	0.194	39	25 03	0.106	0.096	0.045
19	83 03	0.205	0.0248	0.203	40	24 03	0.103	0.095	0.042
18	82 03	0.216	0 0298	0.214	41	23 03	0.101	0.093	0.040
17	81 03	0.228	0.0354	0.225	42	22 03	0.100	0.092	0.037
16	80 03	0.242	0.0418	0.238	43	21 03	0.098	0.091	0.035
15	79 03	0.256	0.0488	0.253	44	20 03	0.096	0.090	0.034
14	78 03	0.272	0.0571	0.270	45	19 03	0.094	0.089	0.031
13	77 03	0.290	0.0664	0.289	46	18 03	0.093	0.088	0,029
12	76 03	0.321	0.0773	0.311	47	17 03	0.091	0.087	0.027
11	75 03	0.351	0.0901	0.338	48	16 03	0.089	0.086	0.025
10	74 03	0.384	0.105	0.369	49	15 03	0.088	0.085	0.023
9	73 03	0.426	0.124	0.408	50	14 03	0.087	0.084	0.021
8	72 03	0.479	0.147	0.456	51	13 03	0.086	0.083	0.019
7	71 03	0.547	0.178	0.517	52	12 03	0.085	0.083	0.018
6	70 03	0.638	0.217	0.599	53	11 03	0.083	0.082	0.016
5	69 03	0.765	0.273	0.698	54	10 03	0.082	0.081	0.014
5	59 03	0.765	0.393	0.656	55	9 03	0.081	0.080	0.013
6	58 03	0.638	0.337	0.541	56	8 03	0.080	0.080	0.011
7	57 03	0.547	0.297	0.459	57	7 03	0.079	0.079	0.010
8	56 03	0.479	0.267	0.397	58	6 03	0.078	0.078	0.008
9	55 03	0.426	0.244	0.349	59	5 03	0.077	0.077	0.007
10	54 03	0.384	0.225	0.311	60	4 03	0.077	0.077	0.005
11	53 03	0.351	0.210	0.279	61	3 03	0.076	0.076	0.004
12	52 03	0.321	0.197	0.253	62	2 03	0.075	0.075	0.003
13	51 03	0.296	0.186	0.230	63	1 03	0.074	0.075	0.001
14	50 03	0.278	0.177	0.211	64	0 03	0.074	0.074	0.000
15	49 03	0.258	0.169	0.194	65	0 57	0.073	0.073	0.001
16	48 03	0.242	0.162	0.180	66	1 57	0.073	0.073	0.002
17	47 03	0.228	0.155	0.167	67	2 57	0.072	0.072	0.004
18	46 03	0.216	0.150	0.155	68	3 57	0.071	0.072	0.005
19	45 03	0.205	0.145	0.145	69	4 57	0.071	0.071	0.006
20	44 03	0.195	0.140	0.135	70	5 57	0.071	0.070	0.007
21	43 03	0.186	0.136	0.127	71	6 57	0.070	0.070	0.008
22	42 03	0.178	0.132	0.119	72	7 57	0.070	0.069	0.010
23	41 03	0.170	0.129	0.112	73	8 57	0.069	0.069	0.111
24	40 03	0.164	0.125	0.105	74	9 57	0.069	0.068	0.012
25	39 03	0.158	0.122	0.099	75	10 57	0.069	0.068	0.013
26	38 03	0.152	0.120	0.094	76	11 57	0.068	0.067	0.014
27	37 03	0.147	0.117	0.088	77	12 57	0.068	0.067	0.015
28	36 03	0.143	0.115	0.083	78	13 57	0.068	0.066	0.016
29	35 03	0.137	0.113	0.079	79	14 57	0.068	0.066	0.017
30	34 03	0.133	0.110	0.073	80	15 57	0.067	0.065	0.019
31	33 03	0.129	0.108	0.070	81	16 57	0.067	0.064	0.020
32	32 03	0.126	0.106	0.067	82	17 57	0.067	0.064	0.021
33	31 03	0.122	0.105	0.063	83	18 57	0.067	0.063	0.022

TABLE E—Continued.

N. P. D.	Z. dist.	COLLIN'N FOR 1″. 1 / 15 sin N. P. D.	LEVEL FOR 1″. cos. Z. dist. / 15 sin N. P. D.	AZIMUTH FOR 1″. sin Z. dist. / 15 sin N. P. D.	N. P. D.	Z. dist.	COLLIN'N FOR 1″. 1 / 15 sin N. P. D.	LEVEL FOR 1″. cos Z. dist. / 15 sin N. P. D.	AZIMUTH FOR 1″. sin Z. dist. / 15 sin N. P. D.
	° ″				°	° ″			
84 sub.-polo..	19 57	0.067	0.063	0.023	120 sub.-polo	55 57	0.077	0.043	0.064
85	20 57	0.067	0.062	0.024	121	56 57	0.077	0.042	0.065
86	21 57	0.067	0.062	0.025	122	57 57	0.078	0.042	0.067
87	22 57	0.067	0.061	0.026	123	58 57	0.079	0.041	0.068
88	23 57	0.067	0.061	0.027	124	59 57	0.080	0.040	0.070
89	24 57	0.067	0.060	0.028	125	60 57	0.081	0.039	0.071
90	25 57	0.067	0.060	0.029	126	61 57	0.082	0.039	0.073
91	26 57	0.067	0.059	0.030	127	62 57	0.083	0.038	0.074
92	27 57	0.067	0.059	0.031	128	63 57	0.084	0.037	0.076
93	28 57	0.067	0.058	0.032	129	64 57	0.085	0.036	0.078
94	29 57	0.067	0.058	0.033	130	65 57	0.087	0.035	0.079
95	30 57	0.067	0.057	0.034	131	66 57	0.088	0.034	0.081
96	31 57	0.067	0.057	0.035	132	67 57	0.089	0.034	0.083
97	32 57	0.067	0.056	0.036	133	68 57	0.091	0.033	0.085
98	33 57	0.067	0.056	0.038	134	69 57	0.092	0.032	0.087
99	34 57	0.067	0 055	0.039	135	70 57	0.094	0.031	0.089
100	35 57	0.068	0.055	0.040	136	71 57	0.096	0.030	0.091
101	36 57	0.068	0.054	0.041	137	72 57	0.097	0.029	0.093
102	37 57	0.068	0.054	0.042	138	73 57	0.099	0.027	0.096
103	38 57	0.068	0.053	0.043	139	74 57	0.101	0.026	0.097
104	39 57	0.069	0.053	0.044	140	75 57	0.103	0.025	0.101
105	40 57	0.069	0.052	0.045	141	76 57	0.106	0.024	0.103
106	41 57	0.069	0.051	0.046	142	77 57	0.108	0.023	0.106
107	42 57	0.070	0.051	0.047	143	78 57	0.111	0.021	0.109
108	43 57	0.070	0.050	0.049	144	79 57	0.113	0.020	0.112
109	44 57	0.070	0.050	0.050	145	80 57	0.116	0.018	0.115
110	45 57	0.071	0.049	0.051	146	81 57	0.119	0.017	0.118
111	46 57	0.071	0.049	0.052	147	82 57	0.122	0.015	0.121
112	47 57	0.072	0.048	0.053	148	83 57	0.126	0.013	0.125
113	48 57	0.072	0.047	0.055	149	84 57	0.130	0.011	0.129
114	49 57	0.073	0.047	0.056	150	85 57	0.133	0.009	0.133
115	50 57	0.073	0.046	0.057	151	86 57	0.137	0.007	0.137
116	51 57	0.074	0.046	0.058	152	87 57	0.142	0.005	0.142
117	52 57	0.074	0.045	0.060	153	88 57	0.147	0.003	0.147
118	53 57	0.075	0.044	0.061	154	89 57	0.152	0.000	0.152
119	54 57	0.076	0.044	0.062					

TABLE F.

Right ascensions of moon's centre used in computing the longitude of astronomical station near mouth of the Rio Grande, deduced from corresponding moon culminations, observed at Greenwich, Philadelphia High School, and Radcliffe observatories, 1853. (*C. N. Thom, compiler.*)

Date.	Right ascension of moon's centre.		Difference observed: — N. A.	Right ascension of moon's centre observed at Philadel. High School observatory.	Date.	Right ascension of moon's centre.		Difference observed: — N. A.	Right ascension of moon's centre observed at Philadel. High School observatory.
	Greenwich observations.	Nautical Almanac.				Greenwich observations.	Nautical Almanac.		
1853.	h. m. s.	h. m. s.	s.	h. m. s.	1853.	h. m. s.	h. m. s.	s.	h. m. s.
August 12	15 44 14.00	15 44 14.73	— 0.73	.....	Oct. 13	23 08 15.02	23 08 16.96	— 0.94	22 18 43.58
13	16 45 08 12	16 45 08.76	0.64	.....	14	23 57 27.51	23 57 28.53	1.02	.....
14	17 49 14.30	17 49 15.01	0.81	.....	15	0 44 53.86	0 44 54.80	0.94	.....
15	18 54 04.71	18 54 05.69	0.98	.....	16	1 31 32.27	1 31 33.36	1.09	.....
16	20 00 25.36	20 00 26.51	1.15	.....	17	2 18 16.89	2 18 17.81	0.92	2 28 07.46
17	21 03 07.50	21 03 08.82	1.32	.....	18	3 05 53.28	3 05 54.03	0.75	3 15 59.50
18	22 01 55.78	22 01 57.03	1.25	.....	19	3 54 56.38	3 54 56.86	0.48	4 05 23.77
19	22 56 38.39	22 56 39.41	1.02	23 07 34.76	20	4 45 45.37	4 45 45.58	0.21	.....
20	23 47 49.06	23 47 50.04	0.98	.....	21	5 38 19.33	5 38 19.40	— 0.07	.....
21	0 36 24.88	0 36 25.73	0.85	0 46 19.72	22	6 29 15.98	6 29 15.86	+ 0.12	.....
22	1 23 29.32	1 23 30.03	0.71	.....	23	7 26 55.45	7 26 55.23	+ 0.22	.....
23	2 10 04.52	2 10 05.09	0.57	.....	Nov. 7	21 03 14.68	21 03 15.90	— 1.22	.....
24	2 57 07.07	2 57 07.66	0.59	.....	8	22 00 14.81	22 00 15.98	1.17	*22 00 26.20
Sept. 11	18 33 26.68	18 33 26.79	0.11	.....	9	22 53 02.20	22 53 03.22	1.02	*22 53 13.08
12	19 37 45.20	19 37 45.84	0.64	.....	10	23 42 31.11	23 42 31.72	0.61	*23 42 41.18
13	20 40 03.21	20 40 04.07	0.86	20 52 39.80	11	0 29 47.14	0 29 47.74	0.60	.....
14	21 39 01.98	21 39 03.06	1.08	.....	12	1 15 56.83	1 15 57.47	0.64	.....
15	22 34 17.31	22 34 18.61	1.30	.....	13	2 02 00.84	2 02 01.52	0.68	.....
16	23 26 09.87	23 26 11.40	1.53	23 36 [illegible]	14	2 48 51.37	2 48 52.10	0.73	*2 49 01.40
17	0 15 26.56	0 15 27.89	1.33	.....	15	3 37 08.86	3 37 09.67	0.81	.....
18	1 03 03.29	1 03 04.57	1.28	1 12 [illegible].18	16	4 27 17.41	4 27 18.31	0.90	.....
19	1 49 57.56	1 49 58.79	1.23	.....	17	5 19 19.95	5 19 20.47	0.52	.....
20	2 37 02.74	2 37 03.92	1.18	.....	18	6 12 53.44	6 12 53.80	0.36	.....
October 9	19 18 51.49	19 18 52.07	0.58	.....	19	7 07 14.64	7 07 14.86	0.22	.....
10	20 21 36.47	20 21 37.14	0.67	.....	20	8 01 31.27	8 01 31.30	0.03	.....
11	21 20 54.49	21 20 55.25	0.76	.....	21	8 54 58.29	8 54 58.53	0.24	.....
12	22 16 20.45	22 16 21.30	— 0.85	* 22 27 27.06	22	9 47 13.17	9 47 13.58	— 0.41	.....

* Radcliffe observatory.

TABLE. G.

Tabulation of results for longitude of astronomical station near mouth of Rio Grande, derived from observations made with 46-inch transit (by Troughton & Simms) and with sidereal chronometer No. 2440, (Parkinson & Frodsham:) By G. C. Gardner and J. H. Clark, under the direction of Major W. H. Emory, Chief Astronomer and Surveyor of United States and Mexican boundary survey.

Date of observation.	Moon's limb observed.	Longitude west of Greenwich, deduced from corresponding observations made at—			Adopted values of the observations for each night.	Date of observation.	Moon's limb observed.	Longitude west of Greenwich, deduced from corresponding observations made at—			Adopted values of the observations for each night.
		Greenwich Observatory.	Radcliffe Observatory.	Phila. High School Observatory.				Greenwich Observatory.	Radcliffe Observatory.	Phila. High School Observatory.	
1853.		6h. 28m.	6h. 28m.	6h. 28m.		1853.		6h. 28m.	6h. 28m.	6h. 28m.	
		s.	s.	s.	s.			s.	s.	s.	s.
Aug. 12	1st.....	35.04	.....	.....	35.04	Oct. 10	1st.....	40.56	.....	.....	40.56
13		40.00	.....	.....	40.00	12		24.11	.....	24.96	74.03
15		35.91	.....	.....	35.91	13		20.87	.....	28.00	76.87
16		39.85	.....	.....	39.85	17	2d.....	25.89	.....	34.37	94.63
17		29.28	.....	.....	29.28	18		20.69	.....	24.09	68.87
18	2d.....	20.69	.....	.....	20.69	19		24.86	.....	27.56	79.98
19		22.33	.....	33.69	89.57	20		42.03	.....	.....	42.03
20		14.71	.....	.....	14.71	21		41.25	.....	.....	41.25
21		27.37	.....	35.90	99.07	Nov. 7	1st.....	36.94	.....	.....	36.94
22		27.22	.....	.....	27.22	8		34.05	34.53	.....	68.58
23		33.54	.....	.....	33.54	9		32.15	30.50	.....	62.65
24		32.10	.....	.....	32.10	10		26.23	31.07	.....	57.30
Sept. 12	1st.....	30.23	.....	.....	30.23	11		23.32	.....	.....	23.32
13		30.48	.....	30.60	91.68	12		34.55	.....	.....	34.55
14		37.08	.....	.....	37.08	13		35.93	.....	.....	35.93
15		37.19	.....	.....	37.19	14	1st & 2d.	33.60	30.44	.....	64.04
16		30.72	.....	23.86	78.44	15	2d.....	28.41	.....	.....	28.41
17	2d.....	24.60	.....	.....	24.60	18		28.67	.....	.....	28.67
18		29.69	.....	36.03	101.75	21		29.45	.....	.....	29.45
Oct. 9	1st.....	38.86	.....	.....	38.86	22		26.91	.....	.....	26.91

$$\frac{\text{Sum of "Adopted values of the observations for each night,"}}{\text{Number of observations giving to each its value*}.....} = \frac{1951.78}{64} = 30.48$$

Longitude of astronomical station near mouth of Rio Grande, west of Greenwich Observatory..... = 6 28 30.48
Probable error..... = ± 0.56

NOTE.—Radcliffe Observatory is 5m. 02s.60 west of Greenwich, (Rad. Observations, vol. XIV, page IX;) High School Observatory, Philadelphia, is 5h. 00m. 37s.56 west of Greenwich Observatory. In reducing the results from the Radcliffe and High School observations to Greenwich Observatory, the above differences of longitudes have been applied.

* In the column, "Adopted values of the observations for each night," the results have been obtained by giving double weight to the High School observations, on account of its relative distance from mouth of Rio Grande, and equal weight to Radcliffe and Greenwich observations.

Computation of probable error of the final result for longitude of astronomical station near mouth of the Rio Grande.

1. RESULTS FROM GREENWICH OBSERVATIONS.

(Final longitude = 6h. 28m. 30s.48.)

Date.	Each result.	Δ (final result — each result.)	Δ²	Date.	Each result.	Δ (final result — each result.)	Δ²
1853.	s.	s.	s.	1853.	s.	s.	s.
Aug. 12	35.04	4.56	20.79	Oct. 10	40.56	10.08	101.61
13	40.00	9.52	90.63	12	34.11	6.37	40.57
15	35.91	5.43	29.48	13	30.87	9.61	92.35
16	39.85	9.37	87.73	17	25.89	4.59	21.07
17	29.98	1.20	1.44	18	20.69	9.79	95.84
18	30.69	9.79	95.84	19	24.86	5.62	31.58
19	22.33	8.15	66.42	20	42.03	11.55	133.40
20	14.71	15.77	248.69	21	41.25	10.77	116.00
21	27.27	3.21	10.30	Nov. 7	36.94	6.46	41.73
22	27.22	3.26	10.63	8	34.05	3.57	12.74
23	33.54	3.06	9.36	9	32.15	1.67	2.79
24	32.10	1.62	2.62	10	26.23	4.25	18.06
Sept. 12	30.93	0.25	0.06	11	23.32	7.16	51.26
13	30.48	0.00	0.00	12	34.55	4.07	16.56
14	37.08	6.60	43.56	13	35.93	5.45	29.80
15	37.19	6.71	46.02	14	33.60	3.12	9.73
16	30.72	0.24	0.06	15	28.41	2.07	4.28
17	24.60	5.88	34.57	18	28.67	1.81	3.28
18	29.69	0.79	0.62	21	29.45	1.03	1.06
Oct. 9	38.86	8.38	70.22	22	26.91	3.57	12.74

2. RESULTS FROM PHILADELPAIA HIGH SCHOOL OBSERVATIONS.

(Final longitude = 6h. 28m. 30s.48.)

Date.	Each result.	Δ (final result — each result.)	Δ²	Date.	Each result.	Δ (final result — each result.)	Δ²
1853.	s.	s.	s.	1853.	s.	s.	s.
Aug. 19	33.62	3.14	9.86	Oct. 12	24.96	5.52	30.47
21	35.90	5.42	29 37	13	28.00	2.48	6.04
Sept. 13	30.60	0.12	0.01	17	34.37	3.89	15.13
16	23.86	6.62	43.82	18	24.09	6.39	40.8
18	36.03	5.55	30.80	19	27.56	2.92	8.53

3. RESULTS FROM RADCLIFFE OBSERVATIONS.

(Final longitude = 6h. 28m. 30s.48.)

Date.	Each result.	Δ (final result — each result.)	Δ²	Date.	Each result.	Δ (final result — each result.)	Δ
1853.	s.	s.	s.	1853.	s.	s.	s.
Nov. 8	34.53	4.05	16.40	Nov. 10	31.07	0.59	0.35
9	30.50	0.02	0.00	14	30.44	0.04	0.00

Final longitude..... = 6h. 28m. 30s.48
Probable error..... = ± 0s.56

TABLE H.

Tabulation of results for longitude of astronomical station near mouth of Rio Grande, derived from observations made with 46-inch transit, (by Troughton & Simms,) and with sidereal chronometer No. 2440, (by Parkinson & Frodsham) by G. C. Gardner and J. H. Clark, under the direction of Major W. H. Emory, Chief Astronomer and Surveyor of United States and Mexican boundary survey.

MOON'S FIRST LIMB.					MOON'S SECOND LIMB.				
Date of observation.	Longitude west of Greenwich, deduced from corresponding observations made at—			Adopted values of the observations for each night.	Date of observation.	Longitude west of Greenwich, deduced from corresponding observations made at—			Adopted values of the observations for each night.
	Greenwich Observatory.	Radcliffe Observatory.	Philadelphia High School Observatory.			Greenwich Observatory.	Radcliffe Observatory.	Philadelphia High School Observatory.	
1853.	h. m. s.	h. m. s.	h. m. s.	s.	1853.	h. m. s.	h. m. s.	h. m. s.	s.
August 12	6 28 35.04	.....	.....	35.04	Aug. 18	6 28 20.69	.....	.....	20.69
13	6 28 40.00	.....	.....	40.00	19	6 28 22.33	.....	6 28 33.62	89.57
15	6 28 35.91	.....	.....	35.91	20	6 28 14.71	.....	.....	14.71
16	6 28 39.85	.....	.....	39.85	21	6 28 27.97	.....	6 28 35.90	99.07
17	6 28 29.28	.....	.....	29.28	22	6 28 27.22	.....	.....	27.22
Sept. 12	6 28 30.23	.....	.....	30.23	23	6 28 33.54	.....	.....	33.54
13	6 28 30.48	.....	6 28 30.60	91.68	24	6 28 39.10	.....	.....	39.10
14	6 28 37.08	.....	.....	37.08	Sept. 17	6 28 24.60	.....	.....	24.60
15	6 28 37.19	.....	.....	37.19	18	6 28 29.69	.....	6 28 36.03	101.75
16	6 28 30.79	.....	6 28 23.65	78.44	Oct. 17	6 28 25.89	.....	6 28 34.37	94.63
October 9	6 28 38.86	.....	.....	38.86	18	6 28 20.69	.....	6 28 24.09	68.87
10	6 28 40.56	.....	.....	40.56	19	6 28 24.86	.....	6 28 27.56	79.98
12	6 28 24.11	.....	6 28 24.96	74.03	20	6 28 42.03	.....	.....	42.03
13	6 28 20.87	.....	6 28 28.00	76.87	21	6 28 41.25	.....	.....	41.25
Nov. 7	6 28 36.94	.....	.....	36.94	Nov. 14	6 28 33.60	6 28 30.44	.....	64.04
8	6 28 34.05	6 28 34.53	.....	68.58	15	6 28 28.41	.....	.....	28.41
9	6 28 32.15	6 28 30.50	.....	62.65	18	6 28 28.67	.....	.....	28.67
10	6 28 26.23	6 28 31.07	.....	57.30	21	6 28 29.45	.....	.....	29.45
11	6 28 23.39	.....	.....	23.39	22	6 28 26.91	.....	.....	26.91
12	6 28 34 55	.....	.....	34.55					
13	6 28 35.93	.....	.....	35.93					
14	6 28 33.60	6 28 30.44	.....	64.04					
Sum of adopted values of the observations for each night,				1068.33	Sum of adopted values of the observations for each night,				947.49
No. of observations giving to each its value*.....				34 = 31.42	No. of observations giving to each its value*.....				32 = 29.61

	h. m. s.		h. m. s.
Resulting longitudes from observations on moon's 1st limb...	= 6 28 31.42	Mean longitude.....	= 6 28 30.52
Do.....do.....do.....2d limb...	= 6 28 29.61		

Longitude of astronomical station near mouth of Rio Grande, west of Greenwich Observatory..... = 6h. 28m. 30s.52

NOTE.—Radcliffe Observatory is 5m. 09s.60 west of Greenwich, (Rad. Observations, vol. XIV, page IX.) High School Observatory, Philadelphia, is 5h. 00m. 37s.56 west of Greenwich Observatory. In reducing the results from the Radcliffe and High School observations to Greenwich observations, the above differences of longitudes have been applied.

* In the column "Adopted values of the observations for each night," the results have been obtained by giving double weight to the High School observations, on account of its relative distance from the mouth of the Rio Grande, and equal weight to Radcliffe and Greenwich observations.

TABLE I.

Tabulation of results for longitude of astronomical station near mouth of Rio Grande, derived from observations made with 46-inch transit, (by Troughton & Simms,) and with sidereal chronometer No. 2440, (by Parkinson & Frodsham:) By G. C. Gardner and J. H. Clark, under the direction of Major W. H. Emory, Chief Astronomer and Surveyor of United States and Mexican boundary survey. (C. N. Thom, computer.)

Date of observation.	Moon's limb observed.	Longitude west of Greenwich, deduced from corresponding observations made at—			Adopted values of the observations for each night.	Date of observation.	Moon's limb observed.	Longitude west of Greenwich, deduced from corresponding observations made at—			Adopted values of the observations for each night.
		Greenwich Observatory.	Radcliffe Observatory.	Phila. High School Observatory.				Greenwich Observatory.	Radcliffe Observatory.	Phila. High School Observatory.	
1853.		h. m. s.	h. m. s.	h. m. s.	s.	1853.		h. m. s.	h. m. s.	h. m. s.	s.
Aug. 13	1st.....	6 28 40.00	6 28 00.00	.....	40.00	Oct. 13	1st.....	....	.....	6 28 28 00	56.00
17		6 28 29.28	.....	.....	29.28	17	2d.....	.....	.....	6 28 34.37	68.74
18	2d.....	6 28 20.69	.....	.....	20.69	18		6 28 20.69	.....	6 28 24.09	68.87
19		.....	.....	6 28 33.62	67.24	19		....	.....	6 28 27.56	55.12
21		.....	.....	6 28 35.90	71.80	20		6 28 42.03	.....	.....	42.03
23		6 28 33.54	.....	.....	33.54	Nov. 8	1st.....	.....	6 28 34.53	.....	34.53
24		6 28 32.10	.....	.....	32.10	9		6 28 32.15	6 28 30.50	.....	62.65
Sept. 13	1st.....	6 28 30.48	.....	6 28 30.60	91.68	10		6 28 26.22	6 28 31.07	.....	57.30
16		6 28 30.72	.....	6 28 23.86	78.44	11		6 28 23.32	.....	.....	23.32
17	2d.....	6 28 24.60	.....	.....	24.60	13		6 28 35.93	.....	.....	35.93
18		6 28 29.69	.....	6 28 36.03	101.75	14	1st & 2d.	6 28 33.60	6 28 30.44	.....	64.04
Oct. 9	1st.....	6 28 38.86	.....	.....	38.86	18	2d.....	6 28 28.67	.....	.....	28.67
19		.....	.....	6 28 24.96	49.92	21		6 28 29.45	.....	.....	29.45

$$\frac{\text{Sum of "Adopted values of the observations for each night,"}}{\text{Number of observations giving to each its value*.....}} = \frac{1306.55}{\quad} = 30.38$$

Longitude of astronomical station near mouth of Rio Grande, west of Greenwich Observatory..... ..... 6h. 28m. 30s.38

NOTE.—Radcliffe Observatory is 5m. 02s.60 west of Greenwich, (Rad. Observations, vol. XIV, page IX;) High School Observatory, Philadelphia, is 5h. 00m. 37s.56 west of Greenwich Observatory. In reducing the results from the Radcliffe and High School observations to Greenwich Observatory, the above differences of longitudes have been applied.

* In the column, "Adopted values of the observations for each night," the results have been obtained by giving double weight to the High School observations, on account of its relative distance from the mouth of Rio Grande, and equal weight to Radcliffe and Greenwich observations.

TABLE K.

Tabulation of results for longitude of astronomical station near mouth of Rio Grande, derived from observations made with 46-inch transit, (by Troughton & Simms,) and with sidereal chronometer No. 2440, (by Parkinson & Frodsham:) By G. C. Gardner and J. H. Clark, under the direction of Major W. H. Emory, Chief Astronomer and Surveyor of the United States and Mexican boundary survey. (C. N. Thom, computer.)

MOON'S FIRST LIMB.

Date of observation.	Longitude west of Greenwich, deduced from corresponding observations made at—			Adopted values of the observations for each night.
	Greenwich Observatory.	Radcliffe Observatory.	Philadelphia High School Observatory.	
1853.	h. m. s.	h. m. s.	h. m. s.	s.
August 13	6 28 40.00	6 28 00.00	6 28 00.00	40.00
17	6 28 29.28	.....	.....	29.28
Sept. 13	6 28 30.48	.....	6 28 30.60	91.68
16	6 28 30.72	.....	6 28 23.86	78.44
October 9	6 28 38.86	.....	.....	38.86
12	.....	.....	6 28 24.96	49.92
13	.....	.....	6 28 28.00	56.00
Nov. 8	.....	6 28 34.53	.....	34.53
9	6 28 32.15	6 28 30.50	.....	69.65
10	6 28 26.23	6 28 31.07	.....	57.30
11	6 28 23.32	.....	.....	23.32
13	6 28 35.93	.....	.....	35.93
14	6 28 33.60	6 28 30.44	.....	64.04

Sum of adopted values of the observations for each night, 661.95 / Number of observations giving to each its value* ..... 22 = 30.09

MOON'S SECOND LIMB.

Date of observation.	Longitude west of Greenwich, deduced from corresponding observations made at—			Adopted values of the observations for each night.
	Greenwich Observatory.	Radcliffe Observatory.	Philadelphia High School Observatory.	
1853.	h. m. s.	h. m. s.	h. m. s.	s.
Aug. 18	6 28 20.69	6 28 00.00	6 28 00.00	20.69
19	.....	.....	6 28 33.62	67.24
21	.....	.....	6 28 35.90	71.80
23	6 28 33.54	.....	.....	33.54
24	6 28 39.10	.....	.....	39.10
Sept. 17	6 28 24.60	.....	.....	24.60
18	6 28 29.69	.....	6 28 36.03	101.75
Oct. 17	.....	.....	6 28 34.37	68.74
18	6 28 20.69	.....	6 28 24.09	68.87
19	.....	.....	6 28 27.56	55.12
20	6 28 42.03	.....	.....	42.03
Nov. 14	6 28 33.60	6 28 30.44	.....	64.04
18	6 28 28.67	.....	.....	28.67
21	6 28 29.45	.....	.....	29.45

Sum of adopted values of the observations for each night, 708.64 / Number of observations giving to each its value*..... 23 = 30.81

Mean longitude from observations on moon's 1st limb..... = h. m. s. 6 28 30.09
Do..... .....do.....2d limb..... = 6 28 30.81

Mean longitude from observations on moon's 1st and 2d limbs = h. m. s. 6 28 30.45

Longitude of astronomical station near the mouth of the Rio Grande west of Greenwich Observatory..... = h. m. s. 6 28 30.45

NOTE.—Radcliffe Observatory is 5m. 09.60s. west of Greenwich, (Radcliffe Observations, vol. XIV, page IX.) High School Observatory, Philadelphia, is 5h. 00m. 37.56s. west of Greenwich Observatory. In reducing the results from the Radcliffe and High School observations to Greenwich observations, the above differences of longitudes have been applied.

* In the column "Adopted values of the observations for each night," the results have been obtained by giving double weight to the High School observations on account of its relative distance from the mouth of the Rio Grande, and equal weight to the Radcliffe and Greenwich observations.

TABLE VIII.

Tabulation of results for the latitude of astronomical station at Frontera, Texas, derived from observations made with the zenith telescope No. 4, on twenty-four pairs of stars: By Major W. H. Emory, Chief Astronomer and Surveyor of United States and Mexican boundary survey.

Date.	1st pair. B. A. C. 2194 S. 2270 N.	2d pair. B. A. C. 2444 S. 2341 N.	3d pair. B. A. C. 2469 S. 2504 N.	4th pair. B. A. C. 2479 S. 2504 N.	5th pair. B. A. C. 2605 S. 2691 N.	6th pair. B. A. C. 2788 S. 2798 N.	7th pair. B. A. C. 2818 S. 2855 N.
1852, March 23	° ′ ″	° ′ ″	° ′ ″	° ′ ″ 31 48 45.44	° ′ ″ 31 48 39.20	° ′ ″ 31 48 47.48	° ′ ″ 31 48 45.62
24	.....	.....	31 48 41.45	31 48 51.55	31 48 43.67	31 48 48.23	31 48 43.56
25	.....	31 48 44.19	31 48 40.03	.....	31 48 37.33	31 48 49 27	31 48 44.01
26	.....	.....	31 48 38.80	31 48 47.83	.....	31 48 49 01	31 48 44.01
27	31 48 42.63	31 48 46.35	31 48 41.18	31 48 50.31	31 48 38.79	31 48 49.33	31 48 44 20
28	.....	.....	31 48 43.93	31 48 47.86	31 48 38.77	31 48 49.76	31 48 43.19
30	.....	31 48 44.44	.....	.....	.....	31 48 48.56	31 48 45.23
Latitude by a mean of each pair.	31 48 42.63	31 48 44.99	31 48 41.08	31 48 48.60	31 48 45.55	31 48 48.81	31 48 44.35
Corrections for declination.....	0.00	0.00	+ 1.20	0.00	+ 0.69	— 3.28	— 1.00
Corrected latitude	31 48 42.63	31 48 44.99	31 48 42.28	31 48 48.60	31 48 46.24	31 48 45.53	31 48 43.35

TABLE VIII—Continued.

Date.	8th pair. B. A. C. 2932 S. 2912 N.	9th pair. B. A. C. 3109 S. 3033 N.	10th pair. B. A. C. 3181 S. 3131 N.	11th pair. B. A. C. 3201 S. 3252 N.	12th pair. B. A. C. 3301 S. 3361 N.	13th pair. B. A. C. 3355 S. 3399 N.	14th pair. B. A. C. 3409 S. 3427 N.
1852, March 23	° ′ ″ 31 48 50.75	° ′ ″ 31 48 44.97	° ′ ″ 31 48 34.71	° ′ ″ 31 48 45.88	° ′ ″ 31 48 49.25	° ′ ″ 31 48 46.75	° ′ ″ .....
24	31 48 49.85	.....	.....	.....	.....	.....	.....
25	31 48 48.87	31 48 43.01	31 48 40.96	31 48 43.19	31 48 42.88	31 48 48.25	31 48 48.33
26	31 48 48.93	31 48 46.18	31 48 41.57	31 48 46.26	31 48 44.41	31 48 47.64	31 48 48.20
27	31 48 50.09	31 48 43.94	31 48 42.01	31 48 46.81	31 48 44.94	31 48 50.31	.....
28	31 48 49.93	31 48 44.70	31 48 42.64	.....	.....	.....	.....
30	31 48 48.48	31 48 44.45	31 48 41.37	31 48 46.14	31 48 47.21	31 48 47.19	31 48 49.68
Latitude by a mean of each pair.	31 48 49.56	31 48 44.37	31 48 40.38	31 48 45.64	31 48 45.74	31 48 48.03	31 48 48.74
Corrections for declination.....	— 3.11	+ 1.27	+ 1.56	— 1.86	— 2.86	— 3.91	— 1.91
Corrected latitude.....	31 48 46.45	31 48 45.64	31 48 41.94	31 48 43.78	31 48 42.88	31 48 44.12	31 48 47.53

TABLE VIII—Continued.

Date.	15th pair. B. A. C. 3671 S. 3584 N.	16th pair. B. A. C. 3710 S. 3736 N.	17th pair. B. A. C. 3842 S. 3781 N.	18th pair. B. A. C. 3915 S. 3952 N.	19th pair. B. A. C. 3990 S. 3973 N.	20th pair. B. A. C. 4014 S. 4026 N.	21st pair. B. A. C. 4014 S. 4028 N.	22d pair. B. A. C. 4066 S. 4126 N.
1852, March 23	° ′ ″ 31 48 42.88	° ′ ″	° ′ ″ 31 48 45.40	° ′ ″ 31 48 45.98	° ′ ″ 31 48 45.81	° ′ ″ 31 48 45.73	° ′ ″ 31 48 43.36	° ′ ″ .....
24	.....	.....	.....	.....	.....	.....	.....	.....
25	31 48 43.03	31 48 39.15	31 48 42.97	31 48 45.98	31 48 45.39	31 48 47.69	31 48 48.38	.....
26	31 48 43.78	31 48 41.70	31 48 43.73	31 48 44.49	31 48 44.88	31 48 45.92	31 48 45.82	.....
27	31 48 44.87	31 48 40.77	31 48 45.56	31 48 46.58	31 48 45.30	31 48 48.59	31 48 48.74	.....
28	.....	.....	.....	.....	.....	.....	.....	.....
30	31 48 44.58	31 48 43.00	31 48 42.96	.....	31 48 44.99	31 48 47.37	31 48 48.07	31 48 50.56
Latitude by a mean of each pair	31 48 43.83	31 48 41.15	31 48 43.84	31 48 45.41	31 48 45.27	31 48 47.06	31 48 46.87	31 48 50.58
Corrections for declination.....	— 0.12	+ 2.69	— 0.33	0.00	— 1.61	— 2.22	— 2.95	— 1.25
Corrected latitude.....	31 48 43.71	31 48 43.84	31 48 43.51	31 48 45.41	31 48 43.66	31 48 44.84	31 48 43.92	31 48 49.31

TABLE VIII—Continued.

Date.	23d pair. B. A. C. 4141 S. 4188 N.	24th pair. B. A. C. 4212 S. 4258 N.	Results for latitude by a mean of each night, (declin's corrected.)	1st result. Lat. by a mean of all the pairs, (declin's corrected.)	2d result. Lat. by a mean of all the observations, (declinations corrected.)	3d result. Lat. by a meap of results for each night, (declinations corrected.)	Final result. Mean of 1st, 2d, and 3d results.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1852, March 23	.....	.....	31 48 43.69				
24	.....	.....	31 48 45.47				
25	.....	.....	31 48 43.31				
26	.....	.....	31 48 44.24				
27	.....	.....	31 48 44.78				
28	.....	.....	31 48 44.76				
30	31 48 44.50	31 48 40.80	31 48 44.67				
Latitude by a mean of each pair.	31 48 44.50	31 48 40.80					
Corrections for declination	+ 1.70	— 1.86					
Corrected latitude	31 48 46.20	31 48 38.94		31 48 44.60	31 48 44.56	31 48 44.42	31 48 44.53

Latitude of astronomical station at Frontera, Texas, = 31° 48′ 44″.53.

TABLE IX *

Corrections to be applied to the results for latitude of astronomical station at Frontera, Texas, in order to introduce the elements of the stars as observed at the Washington Observatory, in 1852 *and* 1853.

Number of pair.	Names of stars.	DECLINATIONS. B. A. C.	DECLINATIONS. Washington Observatory catalogue.	Difference.	½ differ'ce, or error for correction.	Number of pair.	Names of stars.	DECLINATIONS. B. A. C.	DECLINATIONS. Washington Observatory catalogue.	Difference.	½ differ'ce, or error for correction.
		° ′ ″	° ′ ″					° ′ ″	° ′ ″		
1	2194	25 16 27.2	.....	.....	.....	13	3355	21 52 37.10	21 52 32.91	— 4.19	
	2270	38 15 10.2	.....	.....	.....		3399	41 46 05.1	41 46 01.47	— 3.63	— 3.91
2	2444	11 57 33.9	.....	.....	.....	14	3409	30 21 37.5	30 21 42.02	+ 4.52	
	2341	51 40 15.9	.....	.....	.....		3427	33 22 15.4	33 22 08.45	— 6.95	— 1.21
3	2469	28 13 14.8	28 13 13.23	— 1.57		15	3671	23 58 20.1	23 58 19.01	— 1.09	
	2504	35 22 41.4	35 22 45.38	+ 3.98	+ 1.20		3584	39 41 26.0	39 41 26.85	+ 0.85	— 0.12
4	2472	28 13 18.2	.....	.....	.....	16	3710	28 45 53.2	28 45 52.17	— 1.03	
	2504	35 22 41.4	.....	.....	.....		3736	34 49 57.6	34 50 04.01	+ 6.41	+ 2.69
5	2605	19 42 13.3	19 42 15.82	+ 2.52		17	3842	23 54 44.6	23 54 44.11	— 0.49	
	2691	43 41 09.0	43 41 07.85	— 1.15	+ 0.69		3781	39 40 30.1	39 40 29.93	— 0.17	— 0.33
6	2788	21 13 04.8	21 13 00.04	— 4.76		18	3915	19 14 07.4	.....	.....	.....
	2798	42 28 59.8	42 28 58.00	— 1.80	— 3.28		3952	44 27 23.9	.....	.....	.....
7	2818	25 01 17.5	25 01 23.85	+ 6.35		19	3990	21 03 10.7	21 03 08.32	— 2.38	
	2855	38 31 42.2	38 31 33.85	— 8.35	— 1.00		3973	42 33 18.6	42 33 17.75	— 0.85	— 1.61
8	2932	31 14 16.0	31 14 13.21	— 2 79		20	4014	16 16 27.6	16 16 22.96	— 4.64	
	2912	32 28 07.5	32 28 04.07	— 3.43	— 3.11		4096	47 18 42.1	47 18 42.30	+ 0.20	— 2.22
9	3109	30 15 09.4	30 15 13.90	+ 4 50		21	4014	16 16 27.6	16 16 22.96	— 4.64	
	3033	33 29 02.8	33 29 00.84	— 1.96	+ 1.27		4098	47 18 17.6	47 18 16.34	— 1.26	— 2.95
10	3181	19 43 16.7	19 43 21.36	+ 4.66		22	4066	22 17 43.8	22 17 41.73	— 2.07	
	3131	43 49 57.8	43 49 56.25	— 1.55	+ 1.56		4126	41 29 46.1	41 29 45.67	— 0.43	— 1.25
11	3201	26 33 36.2	26 33 33.46	— 2.74		23	4141	23 52 08.2	23 52 07.81	— 0.39	
	3252	37 08 55.7	37 08 54.73	— 0.97	— 1.86		4188	39 51 02.6	39 51 06.39	+ 3.79	+ 1.70
12	3201	26 33 36.2	26 33 33.46	— 2.74		24	4212	21 43 43.3	21 43 39.31	— 3.99	
	3261	37 03 39.3	37 03 36.32	— 2.98	— 2.86		4258	41 42 03.4	41 42 03.67	+ 0.27	— 1.86

* The reference on page 193 to table IXa should be VIII.

TABLE X.

Result of observations on the prime vertical for latitude: By Lieut. A. W. Whipple, at Presidio de San Elceario.

Date.	Star observed.	Result from each observation.	Result from mean of wires.	Date.	Star observed.	Result from each observation.	Result from mean of wires.	Final result.
1851.		° ′ ″	° ′ ″	1851.		° ′ ″	° ′ ″	
Jan. 29	β Geminorum.....	31 35 13.80		Feb. 3	2082 Aurigæ.....	31 35 12.73		
		11.98	31 35 12.62			13.67	31 35 13.43	
		12.79				13.90		Lat. of Presidio de San Elceario.. 31 35 13.616
	1768 Aurigæ.....	10 54			1768 Aurigæ	12.49		
		12.09	11.32			13.55	12.99	
						12 93		
	2082 Aurigæ.....	11.87						
		09.35	10.63	Feb. 4	1768 Aurigæ	11.90		
		10.68				10.96	10.96	
						10.71		
Feb. 3	β Geminorum.....	12.55						
		13.96	13.80		2340 Geminorum....	17.39		
		14.90				14.14	15.18	
						13.95		

TABLE XI.

Tabulation of results for the latitude of astronomical station on the Rio Grande, near the mouth of the cañon, derived from observations made with zenith telescope No. 4, on twenty-one pairs of stars: By Major W. H. Emory, Chief Astronomer and Surveyor of United States and Mexican boundary survey.

Date.	1st pair.	2d pair.	3d pair.	4th pair.	5th pair.	6th pair.	7th pair.
	B. A. C. 4594 S. 4697 N.	B. A. C. 4708 S. 4747 N.	B. A. C. 4810 S. 4783 N.	B. A. C. 4873 S. 4841 N.	B. A. C. 5048 S. 4958 N.	B. A. C. 5023 S. 5099 N.	B. A. C. 5034 S. 5087 N.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1852, June 24.....	31 02 20.04	31 02 26.01	31 02 27.73	31 02 28.16	31 02 31.35	31 02 23.79	31 02 28.00
25.....	31 02 30.20	31 02 28.49	31 02 26.49	31 02 27.37	31 02 31.26	31 02 21.76	31 02 24.00
26.....	.....	31 02 22.10	.....	31 02 30.45	21 02 23.19	.....	.....
Latitude by a mean of each pair.	31 02 25.12	31 02 25.53	31 02 27.11	31 02 28.66	31 02 28.60	31 02 22.78	31 02 26.00
Corrections for declinations....	— 2 53	— 0.37	0.00	+ 1.02	— 3.93	0.00	0.00
Corrected latitude.....	31 02 22.59	31 02 25.16	31 02 27.11	31 02 29.68	31 02 24.67	31 02 22.78	31 02 26.00

TABLE XI—Continued.

Date.	8th pair.	9th pair.	10th pair.	11th pair.	12th pair.	13th pair.	14th pair.
	B. A. C. 5541 S. 5473 N.	B. A. C. 5659 S. 5693 N.	B. A. C. 5732 S. 5706 N.	B. A. C. 5898 S. 5895 N.	B. A. C. 5841 S. 5795 N.	B. A. C. 5866 S. 5886 N.	B. A. C. 5902 S. 5927 N.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1852, June 24.....	31 02 26.95	31 02 24.83	.....	31 02 27.53	.....	.....	.....
25.....	31 02 29.16	31 02 24.44	31 02 28.85	.....	31 02 29.28	31 02 26.96	31 02 27.10
26.....	.....	31 02 26.33	.....	.....	31 02 27.17	31 02 25.62	31 02 27.54
Latitude by a mean of each pair.	31 02 28.05	31 02 25.20	31 02 28.85	31 02 27.53	31 02 28.23	31 02 26.29	31 02 27.32
Corrections for declinations....	0.00	— 1.25	0.00	0.00	+ 0.32	+ 0.05	0.00
Corrected latitude.....	31 02 28.05	31 02 23.95	31 02 28.85	31 02 27.53	31 02 28.55	31 02 26.34	31 02 27.32

TABLE XI—Continued.

Date.	15th pair. B. A. C. 5968 S. 5980 N.	16th pair. B. A. C. 6147 S. 6178 N.	17th pair. B. A. C. 6341 S. 6349 N.	18th pair. B. A. C. 6322 S. 6355 N.	19th pair. B. A. C. 6341 S. 6355 N.	20th pair. B. A. C. 6453 S. 6390 N.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1852, June 24	31 02 28.02	31 02 27.92	31 02 27.99	.....	.....	31 02 26.98
25	31 02 27.39	31 02 28.91	.....	31 02 23.49	31 02 22.59	31 02 26.73
26	31 02 26.70	31 02 26.38	.....	31 02 23.98	31 02 23.54	31 02 26.34
Latitude by a mean of each pair.	31 02 27.35	31 02 27.74	31 02 27.99	31 02 23.70	31 02 23.06	31 02 27.35
Corrections for declinations	0.00	— 1.96	— 0.82	+ 0.99	+ 1.47	— 1.75
Corrected latitude	31 02 27.35	31 02 25.78	31 02 27.17	31 02 24.69	31 02 24.53	31 02 25.60

TABLE XI—Continued.

Date.	21st pair. B. A. C. 6453 S. 6391 N.	Results for latitude by a mean of each night, (declina's corrected.)	1st result. Lat. by a mean of all the pairs, (declinations corrected.)	2d result. Lat. by a mean of all the observations, (declinations corrected.)	3d result. Lat. by a mean of results for each night, (declinations corrected.)	Final result, (being a mean of 1st, 2d, 3d results.)
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1852, June 24	31 02 27.05	31 02 26.06				
25	31 02 28.71	31 02 26.48				
26	31 02 26.41	31 02 25.27				
Latitude by a mean of each pair.	31 02 27.39					
Corrections for declinations	— 1.75					
Corrected latitude	31 02 25.64		31 02 26.15	31 02 26.09	31 02 26.27	31 02 26.15

Latitude of astronomical station on the Rio Grande, near mouth of the cañon..... = 31° 02′ 26″.15

TABLE XIa.

Corrections to be applied to the results for latitude of astronomical station on the Rio Grande, near mouth of the cañon, in order to introduce the elements of the stars given in the Twelve-Year Catalogue.

Number of pair.	Names of stars.	DECLINATIONS. B. A. C.	DECLINATIONS. T. Y. C.	Difference.	½ difference or error for correction.	Number of pair.	Names of stars.	DECLINATIONS. B. A. C.	DECLINATIONS. T. Y. C.	Difference.	½ difference or error for correction.
		° ′ ″	° ′ ″					° ′ ″	° ′ ″		
1	4594	26 27 29.2	26 27 24.14	— 5.06	— 2.53	12	5841	11 01 51.4	11 01 52.04	+ 0.64	+ 0.32
	4627	35 31 04.1					5795	51 02 06.1			
2	4706	25 48 17.5	25 48 16.77	— 0.73	— 0.37	13	5860	24 39 07.2	24 39 07.30	+ 0.10	+ 0.05
	4747	36 12 14.7					5886	37 17 14.3			
3	4810	22 55 24.2	.....	.....	.....	14	5969	30 52 52.2	.....	.....	.....
	4783	39 04 23.0	.....	.....	.....		5927	31 16 27.0	.....	.....	.....
4	4873	17 36 10.4				15	5962	30 52 52.2	.....	.....	.....
	4841	44 17 27.1	44 17 29.13	+ 2.03	+ 1.02		5980	32 35 18.0	.....	.....	.....
5	5048	21 07 34.4	21 07 27.45	— 6.95	°	16	6147	30 29 37.4			
	4958	40 59 06.0	40 59 05.09	— 0.91	— 3.93		6178	31 22 19.7	31 22 15 77	— 3.93	— 1.96
6	5223	14 34 47.7	.....	.....	.....	17	6241	23 12 47.1	23 12 45 13	— 1.97	
	5202	47 35 29.2	.....	.....	.....		6349	38 46 31.4	38 46 31.74	+ 0.34	— 0.82
7	5234	18 36 31.6	.....	.....	.....	18	6322	23 30 30.9	23 30 30.14	— 0.76	
	5287	43 34 40.2	.....	.....	.....		6355	38 38 46.4	38 38 49.14	+ 2.74	+ 0.99
8	5541	30 49 01.4	.....	.....	.....	19	6341	23 29 14.9	23 29 15.11	+ 0.21	
	5473	31 14 37.7	.....	.....	.....		6355	38 38 46.4	38 38 49.14	+ 2.74	+ 1.47
9	5659	30 13 26.6				20	6453	23 27 34.5	23 27 30.99	— 3.51	— 1.75
	5693	31 57 12.8	31 57 10.31	— 2.49	— 1.25		6390	39 30 57.3			
10	5739	15 10 24.9	.....	.....	.....	21	6453	23 27 34.5	23 27 30.99	— 3.51	— 1.75
	5706	46 47 03.1	.....	.....	.....		6[illegible]	39 27 29.9			
11	5828	25 01 10.2	.....	.....	.....						
	5895	37 05 21.0	.....	.....	.....						

TABLE XII.

Tabulation of results for the latitude of astronomical station opposite Presidio del Norte, derived from observations made with zenith telescope No. 4, on twenty-six pairs of stars: By Major W. H. Emory, Chief Astronomer and Surveyor of the United States and Mexican boundary survey.

Date.	1st pair. B. A. C. 4993 S. 5072 N.	2d pair. B. A. C. 5048 S. 5084 N.	3d pair. B. A. C. 5132 S. 5122 N.	4th pair. B. A. C. 5132 S. 5130 N.	5th pair. B. A. C. 5146 S. 5168 N.	6th pair. B. A. C. 5273 S. 5295 N.	7th pair. B. A. C. 5426 S. 5460 N.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1852, July 15	29 34 07.15	.....	29 34 07.16	29 34 06.89	.....	29 34 08.32	29 34 03.90
16	29 34 08.49	.....	29 34 08.30	29 34 08.77	.....	29 34 07.42	29 34 04.46
18	.....	29 34 11.00	.....	.....	29 34 09.50	29 34 06.71	29 34 04.77
21	.....	.....	.....	.....	.....	.....	29 34 05.26
22	.....	.....	.....	.....	.....	29 34 07.53	.....
Aug. 10	.....	.....	.....	.....	.....	.....	.....
12	.....	.....	.....	.....	.....	.....	.....
18	.....	.....	.....	.....	.....	.....	.....
Latitude by a mean of each pair.	29 34 07.82	29 34 11.00	29 34 07.73	29 34 07.83	29 34 09.50	29 34 07.49	29 34 04.60
Corrections for declinations	— 0.96	— 2.74	0.00	0.00	— 1.10	— 0.60	0.00
Corrected latitude	29 34 06.86	29 34 08.26	29 34 07.73	29 34 07.83	29 34 08.40	29 34 06.89	29 34 04.60

TABLE XII—Continued.

Date.	8th pair. B. A. C. 5527 S. 5546 N.	9th pair. B. A. C. 5677 S. 5619 N.	10th pair. B. A. C. 5883 S. 5788 N.	11th pair. B. A. C. 5900 S. 5929 N.	12th pair. B. A. C. 6021 S. 5986 N.	13th pair. B. A. C. 6150 S. 6087 N.	14th pair. B. A. C. 6241 S. 6235 N.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1852, July 15	.....	.....	29 34 06.86	.....	29 34 08.74	.....	.....
16	29 34 05.54	29 34 04.11	29 34 06.50	29 34 04.90	.....	29 34 08.21	29 34 07.82
18	29 34 06.34	29 34 03.93	.....	29 34 03.97	29 34 09.05	29 34 08.17	29 34 07.94
21	29 34 04.93	29 34 04.19	29 34 06.42	29 34 04.71	29 34 09.58	29 34 07.50	29 34 07.88
22	29 34 06.42	29 34 03.82	29 34 07.31	29 34 05.49	29 34 08.49	29 34 07.74	29 34 07.49
Aug. 10	.....	29 34 02.55	.....	29 34 03.09	29 34 08.69	29 34 07.87	29 34 05.69
12	.....	29 34 02.71	29 34 06.85	29 34 04.27	29 34 08.76	29 34 07.62	29 34 06.20
18	.....	29 34 02.50	29 34 06.42	29 34 03.70	29 34 08.00	29 34 06.93	29 34 07.53
Latitude by a mean of each pair.	29 34 05.81	29 34 03.40	29 34 06.73	29 34 04.30	29 34 08.76	29 34 07.72	29 34 07.12
Corrections for declinations	0.00	0.00	+ 0.23	+ 1.69	0.00	+ 0.10	— 1.08
Corrected latitude	29 34 05.81	29 34 03.40	29 34 06.96	29 34 05.99	29 34 08.76	29 34 07.82	29 34 06.04

TABLE XII—Continued.

Date.	15th pair. B. A. C. 6387 S. 6349 N.	16th pair. B. A. C. 6387 S. 6355 N.	17th pair. B. A. C. 6453 S. 6466 N.	18th pair. B. A. C. 6589 S. 6599 N.	19th pair. B. A. C. 6648 S. 6740 N.	20th pair. B. A. C. 6673 S. 6740 N.	21st pair. B. A. C. 6714 S. 6740 N.	22d pair. B. A. C. 6794 S. 6817 N.
1852, July 15	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
16	29 34 07.94	29 34 07.70	.....	29 34 08.47	29 34 07.01	29 34 06.48	29 34 06.40	.....
18	29 34 05.59	29 34 05.53	29 34 09.97	29 34 08.60	29 34 06.87	29 34 07.61	29 34 07.53	29 34 09.29
21	29 34 07.48	29 34 08.16	29 34 09.55	29 34 08.88	29 34 07.92	.....	.....	29 34 09.63
22	29 34 06.65	29 34 07.22	29 34 09.79	29 34 08.79	.....	.....	.....	.....
Aug. 10	29 34 05.46	29 34 06.06	.....	29 34 08.48	29 34 05.73	29 34 04.90	29 34 04.85	29 34 09.88
12	29 34 04.40	29 34 05.82	.....	29 34 08.60	29 34 05.35	29 34 05.38	29 34 06.49	29 34 07.04
18	29 34 05.46	29 34 06.36	.....	29 34 09.68	29 34 06.49	29 34 05.81	29 34 06.04	29 34 09.29
Latitude by a mean of each pair	29 34 06.04	29 34 06.69	29 34 09.77	29 34 08.79	29 34 06.56	29 34 06.04	29 34 06.26	29 34 09.02
Corrections for declinations	— 0.01	+ 1.45	— 1.71	+ 0.39	+ 0.09	0.00	0.00	+ 0.24
Corrected latitude	29 34 06.03	29 34 08.14	29 34 08.06	29 34 09.18	29 34 06.65	29 34 06.04	29 34 06.26	29 34 09.26

TABLE XII—Continued.

Date.	23d pair. B. A. C. 6883 S. 6851 N.	24th pair. B. A. C. 6883 S. 6851 N.	25th pair. B. A. C. 6973 S. 7029 N.	26th pair. B. A. C. 6978 S. 7029 N.	Results for latitude by a mean of each night. (declinations corrected.)	1st result. Lat. by a mean of all the pairs, (declinations corrected.)	2d result. Lat. by a mean of all the observations, (declinations corrected.)	3d result. Lat. by a mean of results for each night, (declinations corrected.)
1852, July 15	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	′ ″
16	.....	.....	.....	.....	29 34 07.19			
18	29 34 07.60	29 34 05.45	29 34 10.14	29 34 10.54	29 34 07.00			
21	29 34 07.61	29 34 06.07	29 34 10.15	29 34 09.89	29 34 07.37			
22	.....	.....	.....	.....	29 34 07.62			
Aug. 10	29 34 07.07	.....	29 34 09.79	29 34 09.64	29 34 07.27			
12	29 34 06.75	.....	29 34 08.31	29 34 08.90	29 34 06.84			
18	29 34 07.36	.....	.....	.....	29 34 06.65			
					29 34 06.76			
Latitude by a mean of each pair	29 34 07.28	29 34 05.76	29 34 09.60	29 34 09.74				
Corrections for declinations	0.00	0.00	0.00	0.00				
Corrected latitude	29 34 07.28	29 34 05.76	29 34 09.60	29 34 09.74	.....	29 34 07.01	29 34 07.08	29 34 07.09

Latitude of astronomical station opposite Presidio del Norte, (mean of 1st, 2d, and 3d results)..... = 29° 34′ 07″.13

TABLE XII *a*.

Corrections to be applied to the results for latitude of astronomical station at Presidio del Norte, in order to introduce the elements of the stars, as given in the Twelve-Year Catalogue.

Number of pairs.	Names of stars.	DECLINATIONS. B. A. C.	DECLINATIONS. T. Y. C.	Difference.	½ difference or error for correction.	Number of pairs.	Names of stars.	DECLINATIONS. B. A. C.	DECLINATIONS. T. Y. C.	Difference.	½ difference or error for correction.
		° ′ ″	° ′ ″					° ′ ″	° ′ ″		
1	4993	23 40 49.73	23 40 47.81	— 1.92	— 0.96	14	6241	23 12 57.13	23 12 55.32	— 1.81	
	5072	33 28 09.53	.....	.....	.....		6235	36 00 11.14	36 00 10.78	— 0.36	— 1.08
2	5048	21 07 15.76	21 07 08.88	— 6.88		15	6387	20 24 36.31	.....	.....	.....
	5084	37 54 06.16	37 54 07.55	+ 1.39	— 2.74		6349	38 46 44.14	38 46 44.11	— 0.03	— 0.01
3	5132	17 38 30.43	.....	.....	.....	16	6387	20 24 36.31	.....	.....	.....
	5122	41 20 38.50	.....	.....	.....		6355	38 39 00.22	38 39 03.12	+ 2.90	+ 1.45
4	5132	17 38 30.43	.....	.....	.....	17	6453	22 27 49.68	22 27 46.25	— 3.43	— 1.71
	5130	41 24 29.02	.....	.....	.....		6466	36 42 37 25	.....	.....	.....
5	5146	18 09 15.41	18 09 13.21	— 2.20		18	6589	21 08 06.41	.....	.....	.....
	5168	30 50 29.15	30 50 29.15	0.00	— 1.10		6599	37 52 27.96	37 52 28.73	+ 0.77	+ 0.39
6	5273	20 45 01.84	20 45 00.64	— 1.20	— 0.60	19	6648	29 20 12.04	29 20 12.21	+ 0.17	+ 0.09
	5295	38 22 50.68	.....	.....	.....		6740	29 48 59.30	.....	.....	.....
7	5426	19 11 12.58	.....	.....	.....	20	6673	29 09 10.83	.....	.....	.....
	5460	40 04 07.93	.....	.....	.....		6740	29 48 59.30	.....	.....	.....
8	5527	20 48 31.11	.....	.....	.....	21	6714	29 08 29.66	.....	.....	.....
	5546	38 24 04.27	.....	.....	.....		6740	29 48 59.30	.....	.....	.....
9	5677	24 54 37.16	.....	.....	.....	23	6794	18 46 35.30	.....	.....	.....
	5619	34 18 58.74	.....	.....	.....		6817	40 13 37.25	40 13 37.73	+ 0.48	+ 0.24
10	5883	23 06 13 03	23 06 13.50	+ 0.47	+ 0.23	23	6882	24 23 40.51	.....	.....	.....
	5788	36 07 59.98	.....	.....	.....		6851	34 41 36.22	.....	.....	.....
11	5900	20 12 40.87	20 12 44.25	+ 3.38	+ 1.69	24	6883	24 31 41.36	.....	.....	.....
	5929	38 59 54.13	.....	.....	.....		6851	34 41 36.22	.....	.....	.....
12	6021	27 48 46.56	.....	.....	.....	25	6973	27 21 53.99	.....	.....	.....
	5986	31 17 13.05	.....	.....	.....		7029	31 43 00.37	.....	.....	.....
13	6150	28 44 52.29	28 44 51.82	— 0.47		26	6978	27 19 29.98	.....	.....	.....
	6087	30 12 24.00	30 12 24.66	+ 0.66	+ 0.10		7029	31 43 00.37	.....	.....	.....

TABLE XIII.

Results for latitude of Eagle Pass, from observations made with sextant, by Lieut. Michler, in 1852.

AUGUST 19.

Polaris.		ε Sagittarii.	
	° ′ ″		° ′ ″
	28 48 17.6		26 55 57.9
	28 48 41.9		26 56 14.7
	28 48 31.1		26 56 05.4
	28 48 31.8		26 56 06.4
	28 48 30.2		26 56 03.0
	28 48 21.0		26 56 10.4
	28 48 29.9		26 56 07.8
			26 56 05.8
Sum .... =	7) 203.5		26 55 59.0
			26 55 54.8
Mean..... =	28 48 29.07		26 56 01.5
Corr. for refraction.. =	1 32.00		26 56 10.2
Lat by Polaris..... =	28 46 57.07	Sum .... =	12) 672 56.9
		Mean..... =	26 56 04.7
		Corr. for refraction. =	1 39.17
		Meridian altitude.. =	26 54 25 53
		Star's decl'n (S)... =	34 26 57.30
			61 21 22.83
			90 00 00.00
		Lat. by 12 obs'ns.. =	28 38 37.17
		Lat. by observat'ns on Polaris..... =	28 46 57.07
		Sum .... =	2) 85 34.94
		Latitude ..... =	28 42 47.1

AUGUST 20.

Polaris.		ε Sagittarii.	
	° ′ ″		° ′ ″
	28 48 37.9		26 55 43.3
	28 48 43.5		26 55 48.2
	28 48 39.8		26 55 56.5
	28 48 37.1		26 56 17 6
			26 56 06.7
Sum .... =	4) 158.3		26 56 07.2
			26 56 12.6
Mean..... =	28 48 39.6		26 56 05.1
Corr. for refraction. =	1 32.26		26 56 10.4
			26 56 22..
Lat. by Polaris.... =	28 47 07.3		26 56 17.8
			26 56 11.0
			26 56 51.9
			26 55.38.0
			26 56 06.0
		Sum .... =	15) 840 55.0
		Mean..... =	26 56 03.7
		Corr. for refraction. =	1 39.18
		Meridian altitude.. =	26 54 24.52
		Star's decl'n (S)... =	34 26 57.00
			61 21 21.52
			90 00 00.00
		Lat. by ε Sagittarii. =	28 38 38.48
		Lat. by Polaris.... =	28 47 07.34
		Sum ..... =	2)57 25 45.82
		Latitude..... =	28 42 52.91

TABLE XIII—Continued.

Result for latitudes of Eagle Pass—Continued.

SEPTEMBER 8.				SEPTEMBER 9.			
Polaris.		Fomalhaut.		Polaris.		Fomalhaut.	
	′ ″		° ′ ″		° ′ ″		° ′ ″
	28 47 10.9		30 57 58.03		28 46 41.3		30 58 01.6
	28 46 55.8		30 57 52.70		28 47 01.1		30 57 33.4
	28 46 59.8		30 57 48.64		28 47 11.7		30 57 40.9
	28 46 45.1		30 57 44.98		28 47 10.3		30 57 43.1
	28 46 55.0		30 57 41.95		28 47 22.5		30 57 47.3
	28 47 03.5		30 57 51.12				30 57 49.8
	28 47 04.0		30 57 54.99	Sum ..... =5)	235 26.9		30 57 33.4
			30 57 58.79				30 57 30.9
Sum ..... =7)	328 53.4		30 57 42.69	Mean..... =	47 05.4		30 57 28.4
			30 57 38.82	Lat. by mean of 5			30 57 30.0
Mean..... =	46 59.1		30 57 48.35	obs'ns on Polaris. =	28 47 05.4		30 57 19.5
Lat. by mean of 7 ob-			30 57 57.61				30 57 51.0
serv'ns on Polaris =	28 46 59.1		30 57 41.37				30 57 29.4
			30 57 44.23				30 57 16.6
			30 57 40 46				30 57 28.4
		Sum ..... =15)	724.03				30 57 90.0
							30 57 23.5
		Meridian altitude.. =	30 57 48.27				30 57 39.8
		Star's decl'n (S)... =	30 24 05.00				30 57 38.9
							30 57 23.9
			61 21 53.27				30 57 59.4
			90 00 00.00				30 58 03.7
		Lat. by Fomalhaut. =	28 38 06.73	Sum ..... =22)			813.1
		Lat. by Polaris.. . =	28 46 59.10				
		Sum ..... =2)	57 25 05.83	Meridian altitude... =			30 57 36.9
				Star's decl'n (S.)... =			30 24 05.0
		Latitude..... =	28 42 32.91				61 21 41.9
							90 00 00.0
							Lat. by Fomalhaut.. = 28 38 18.1
							Lat. by Polaris..... = 28 47 05.4
							Latitude..... = 28 42 41.7

Results for latitude of Eagle Pass, for each date of observation, in 1852.

		° ′ ″
Aug. 19	Latitude by 7 observations on Polaris	= 28 46 57.07
	Latitude by 12 observations on ε Sagittarii	= 28 38 37.17
	Sum	= 2)57 25 34.94
	Latitude	= 28 42 47.12
Aug. 20	Latitude by 4 observations on Polaris	= 28 47 07.34
	Latitude by 15 observations on ε Sagittarii	= 28 38 38.48
	Sum	= 2)57 25 45.82
	Latitude	28 42 52.91
Sept. 8	Latitude by 7 observations on Polaris	= 28 46 59.10
	Latitude by 15 observations on Fomalhaut	= 28 38 06.73
	Sum	= 2)57 25 05.83
	Latitude	= 28 42 39 91

TABLE XIII– Continued.

Results for latitude of Eagle Pass for each date of observation—Continued.

			° ′ ″
Sept. 9	Latitude by 5 observations on Polaris	=	28 47 05.40
	Latitude by 22 observations on Fomalhaut	=	28 38 18.10
	Sum	=	2)57 25 23.50
	Latitude	=	28 42 41.75

RECAPITULATION.

		° ′ ″
Latitude August 19, 1859	=	28 42 47.19
Do...August 20	=	28 42 52.91
Do...September 8	=	28 42 32.91
Do...September 9	=	28 42 41.75
Sum	=	4) 170 54 69
Mean	=	42 43.67

Latitude of Eagle Pass = 28° 42′ 43.″67.

TABLE XIV.

Tabulation of results for the latitude of astronomical station at Ringgold Barracks, derived from observations made with the zenith telescope No. 4, on thirty-two pairs of stars: By Major W. H. Emory, Chief Astronomer and Surveyor of United States and Mexican boundary survey.

Date.	1st pair. B. A. C. 4285 N. 4292 S.	2d pair. B. A. C. 4367 S. 4433 N.	3d pair. B. A. C. 4468 S. 4479 N.	4th pair. B. A. C. 4468 S. 4536 N.	5th pair. B. A. C. 4553 S. 4640 N.	6th pair. B. A. C. 4566 S. 4640 N.	7th pair. B. A. C. 4653 N. 4729 S.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1853, June 4	.....	26 22 28.29	26 22 27.25	26 22 25.66	.....	26 22 28.76	.....
6	26 22 24.14	26 22 31.27	.....	.....	26 22 29.26	26 22 30.35	.....
14	.....	.....	.....	.....	.....	.....	.....
19	.....	26 22 23.89	.....	.....	26 22 28.22	26 22 29.56	.....
24	.....	.....	.....	.....	.....	.....	26 22 26.49
26	.....	.....	.....	.....	.....	.....	26 22 26.73
27	.....	.....	.....	.....	.....	26 22 28.83	.....
28	.....	.....	.....	.....	.....	.....	26 22 25.26
29	.....	.....	.....	.....	.....	.....	.....
Latitude by a mean of each pair.	26 22 24.14	26 22 27.78	26 22 27.25	26 22 25.66	26 22 28.74	26 22 29.37	26 22 26.14
Corrections for declinations	0.00	— 0.34	0.00	+ 0.49	0.00	0.00	0.00
Corrected latitude	26 22 24.14	26 22 27.43	26 22 27.25	26 22 26.15	26 22 28.74	26 22 29.37	26 22 26.14

TABLE XIV—Continued.

Date.	8th pair. B. A. C. 4791 S. 4783 N.	9th pair. G. C. 1147 S. 1163 N.	10th pair. B. A. C. 4791 S. 4783 N.	11th pair. B. A. C. 4864 N. 4853 S.	12th pair. B. A. C. 4864 N. 4993 S.	13th pair. G. C. 1373 N. 1281 S.	14th pair. B A. C. 5252 S. 5473 N.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1853, June 4							
6	26 22 24.90		26 22 28.76				
14						26 22 26.74	
19		26 22 26.95				26 22 30.44	
24		26 22 26.02		26 22 26.24	26 22 27.05	26 22 27.50	26 22 30.48
26		26 22 26.92		26 22 26.50	26 22 28.14		
27		26 22 28.42		26 22 27.46	26 22 28.52	26 22 29.13	26 22 30.19
28		26 22 28.02		26 22 27.10	26 22 28.28	26 22 29.40	26 22 30.34
29		26 22 27.74		26 22 26.69	26 22 27.95	26 22 26.38	26 22 30.54
Latitude by a mean of each pair.	26 22 24.90	26 22 27.35	26 22 28.76	26 22 26.80	26 22 27.99	26 22 28.76	26 22 30.37
Corrections for declinations	0.00	0.00	− 3.40	+ 0.10	− 0.96	0.00	0.00
Corrected latitude	26 22 24.90	26 22 27.35	26 22 25.36	26 22 26.90	26 22 27.03	26 22 28.76	26 22 30.37

TABLE XIV—Continued.

Date.	15th pair. G. C. 1341 N. 1417 S.	16th pair. B. A. C. 5452 S. 5473 N.	17th pair. G. C. 1359 N. 1417 S.	18th pair. G. C. 1353 N. 1417 S.	19th pair. G. C. 1369 N. 1415 S.	20th pair. B. A. C. 5716 S. 5834 N.	21st pair. B. A. C. 5716 S. 5895 N.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1853, June 4							
6							
14	26 22 29.38		26 22 30.94	26 22 30.90			
19	26 22 30.76		26 22 31.40	26 22 30.74		26 22 26.69	26 22 25.96
24		26 22 30.63			26 22 28.19	26 22 27.15	26 22 25.07
26						26 22 30.27	26 22 25.94
27		26 22 30.96			26 22 30.02	26 22 25.39	26 22 24.67
28		26 22 30.16			26 22 29.73	26 22 24.85	26 22 24.48
29		26 22 31.74			26 22 29.62	26 22 25.38	26 22 25.43
Latitude by a mean of each pair.	26 22 30.07	26 22 30.88	26 22 31.17	26 22 30.47	26 22 29.39	26 22 26.62	26 22 25.26
Corrections for declinations	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corrected latitude	26 22 30.07	26 22 30.88	26 22 31.17	26 22 30.47	26 22 29.39	26 22 26.62	26 22 25.26

TABLE XIV—Continued.

Date.	22d pair. B. A. C. 5941 S. 6069 N.	23d pair. B. A. C. 5941 S. 6068 N.	24th pair. G. C. 1554 S. 1596 N.	25th pair. B. A. C. 6498 N. 6460 S.	26th pair. G. C. 1659 N. 1736 S.	27th pair. N. 1659 G. C. S. 6663 B. A. C.	28th pair. B. A. C. 6460 S. 6476 N.	29th pair. B. A. C. 6495 N. 6528 S.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1853, June 4								
6								
14			26 22 28.42		26 22 28.68	26 22 27.66		
19			26 22 26.72					
24	26 22 26.39	26 22 27.43	26 22 27.31		26 22 28.55			
26	26 22 25.99	26 22 26.60	26 22 26.67	26 22 25.78			26 22 28.09	
27	26 22 28.30	26 22 28.26	26 22 28.84				26 22 29.35	26 22 26.56
28	26 22 27.28	26 22 27.72	26 22 27.37	26 22 27.31			26 22 26.53	26 22 28.35
29	26 22 27.43	26 22 26.17	26 22 28.36	26 22 26.98			26 22 30.39	
Latitude by a mean of each pair	26 22 27.06	26 22 27.64	26 22 27.70	26 22 26.69	26 22 28.61	26 22 27.66	26 22 29.07	26 22 27.45
Corrections for declinations	— 0.86	— 0.86	0.00	+ 1.53	0.00	0.00	— 0.60	— 0.94
Corrected latitude	26 22 26.22	26 22 26.78	26 22 27.70	26 22 28.22	26 22 28.61	26 22 27.66	26 22 28.47	26 22 27.21

TABLE XIV—Continued.

Date.	30th pair. B. A. C. 6649 S. 6667 N.	31st pair. B. A. C. 6647 S. 6667 N.	32d pair. B. A. C. 6745 N. 6772 S.	Results for lat. by a mean of each night, (decl'ns corrected.)	1st result. Lat. by a mean of all the pairs, (decl'ns corrected.)	2d result. Lat. by a mean of all the observ'ns, (decl'ns corr'd.)	3d result. Lat. by a mean of results for each night, (dec. corr'd.)	Final result. Being a mean of 1st, 2d, and 3d results.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
1853, June 4				26 22 27.51				
6				26 22 27.49				
14				26 22 29.29				
19				26 22 26.30				
24				26 22 27.98				
26	26 22 30.49	26 22 31.76	26 22 26.55	26 22 27.35				
27	26 22 28.66		26 22 26.41	26 22 28.16				
28	26 22 29.22		26 22 27.29	26 22 27.72				
29	26 22 30 28		26 22 27.84	26 22 26.09				
Latitude by a mean of each pair	26 22 29.66	26 22 31.76	26 22 27.59					
Corrections for declinations	0.00	— 2.37	+ 0.22					
Corrected latitude	26 22 29.66	26 22 29.39	26 22 27.74		26 22 27.86	26 22 27.60	26 22 27.91	26 22 27.79

Latitude of astronomical station at Ringgold Barracks = 26° 22′ 27″.79.

TABLE XIV *a*.

Corrections to be applied to the results for latitude of astronomical station at Ringgold Barracks, in order to introduce the elements of the stars, as given in the Twelve-Year Catalogue.

Number of pair.	Names of stars.	DECLINATIONS. B. A. C.	DECLINATIONS. T. Y. C.	Difference.	½ difference, or error for correction.	Number of pair.	Names of stars.	DECLINATIONS. B. A. C.	DECLINATIONS. T. Y. C.	Difference.	½ difference, or error for correction.
		° ′ ″	° ′ ″					° ′ ″	° ′ ″		
1	4985	40 05 39.5	.....	.....	.....	17	1352	.....	34 09 18.85	.....	.....
	4998	19 46 43.5	.....	.....	.....		1417	.....	18 41 37.79	.....	.....
2	4387	11 48 01.7	.....	.....	.....	18	1353	.....	34 03 19.08	.....	.....
	4433	40 56 55.0	40 56 54.32	— 0.68	— 0.34		1417	.....	18 41 37.79	.....	.....
3	4468	14 56 20.9	.....	.....	.....	19	1369	.....	48 12 59.35	.....	.....
	4479	37 49 06.2	.....	.....	.....		1415	.....	10 26 01.70	.....	.....
4	4468	14 56 20.9	.....	.....	.....	20	5716	15 40 48.9	.....	.....	.....
	4536	37 57 07.1	37 57 08.08	+ 0.98	+ 0.49		5834	36 58 54.5	.....	.....	.....
5	4553	23 17 50.3	.....	.....	.....	21	5716	15 40 48.9	.....	.....	.....
	4640	29 23 14.1	.....	.....	.....		5895	37 05 21.0	.....	.....	.....
6	4566	23 15 39.9	.....	.....	.....	22	5941	12 40 25.9	12 40 24.18	— 1.72	— 0.86
	4640	29 23 14.1	.....	.....	.....		6062	40 01 09.3	.....	.....	.....
7	4659	32 45 57.9	.....	.....	.....	23	5941	12 40 25.9	12 40 24.18	— 1.72	— 0.86
	4729	19 57 56.3	.....	.....	.....		6068	40 02 18.3	.....	.....	.....
8	4701	13 39 55.5	.....	.....	.....	24	1534	.....	16 45 48.19	.....	.....
	4783	39 04 23.0	.....	.....	.....		1596	.....	35 59 56.41	.....	.....
9	1147	.....	13 41 56.70	.....	.....	25	6428	48 35 49.0	48 35 53.28	+ 4.28	.....
	1163	.....	36 57 59 91	.....	.....		6460	4 09 47.1	4 09 45.89	— 1.21	+ 1.53
10	4751	13 42 03.5	13 41 56.30	— 6.80	— 3.40	26	1632	.....	33 11 29.68	.....	.....
	4783	39 04 23.0	.....	.....	.....		1736	.....	19 30 28.89	.....	.....
11	4864	27 10 06.4	.....	.....	.....	27	1632	.....	33 11 29.68	.....	.....
	4953	25 36 19.5	25 36 19.70	+ 0.20	+ 0.10		6663	19 35 46.5	.....	.....	.....
12	4864	27 10 06.4	.....	.....	.....	28	6480	4 09 47.1	4 09 45.89	— 1.21	— 0.60
	4993	25 41 08.8	25 41 06.88	— 1.92	— 0.96		6476	48 40 27.0	.....	.....	.....
13	1973	.....	39 31 03.66	.....	.....	29	6495	39 00 44.9	.....	.....	.....
	1981	.....	.....	.....	.....		6598	13 38 40.7	13 38 40.12	— 0.48	—¼0.24
14	5259	21 25 58.6	.....	.....	.....	30	6642	18 38 58.4	.....	.....	.....
	5473	31 14 37.7	.....	.....	.....		6667	36 01 14.5	.....	.....	.....
15	1341	.....	34 14 20.58	.....	.....	31	6647	18 40 08.0	18 40 03.25	— 4.75	— 2.37
	1417	.....	18 41 37.79	.....	.....		6667	36 01 14.5	.....	.....	.....
16	5439	21 29 58.5	.....	.....	.....	32	6745	42 28 27.6	.....	.....	.....
	5473	31 14 37.7	.....	.....	.....		6772	10 15 05.1	10 15 05.54	+ 0.44	+ 0.22

TABLE XV.

Tabulation of results for the latitude of astronomical station at the mouth of the Rio Bravo, derived from observations made with zenith telescope No. 4, on twenty pairs of stars: By Major W. H. Emory, Chief Astronomer and Surveyor of the United States and Mexican boundary survey.

Date.	1st pair. G. C. 1390 N. 1399 S.	2d pair. G. C. 1577 N. 1597 S.	3d pair. B. A. C. 5460 N. 5532 S.	4th pair. B. A. C. 5367 S. 5432 N.	5th pair. B. A. C. 5686 S. 5788 N.	6th pair. B. A. C. 5716 S. 5788 N.	7th pair. B. A. C. 5821 S. 5886 N.	8th pair. B. A. C. 5929 N. 5941 S.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
August 5, 1853	25 57 21.82	25 57 19.50	.....	.....	25 57 23.75	25 57 21.77	25 57 23.67	.....
6, 1853	25 57 22.14	25 57 22.77	25 57 22.00	.....	25 57 21 45	25 57 20.06	25 57 21.05	25 57 23.74
7, 1853	25 57 21.86	25 57 20.24	25 57 21.21	25 57 22.86	25 57 21.88	25 57 20.06	25 57 21.38	25 57 22.76
9, 1853	25 57 22.72	25 57 21.11	.....	.....	.....	.....	25 57 21.71	25 57 22.51
10, 1853	25 57 22.28	25 57 20.52	25 57 22.27	.....	25 57 21.16	25 57 18.89	25 57 21.18	25 57 23.39
11, 1853	25 57 21.83	25 57 21.60	.....	.....	.....	.....	25 57 22.53	25 57 22.66
16, 1853	25 57 21.50	25 57 20.68	.....	.....	25 57 20.67	25 57 18.69	25 57 22.91	25 57 23.81
17, 1853	25 57 22.90	25 57 21.25	.....	.....	.....	25 57 20.82	25 57 23.73	25 57 23.37
18, 1853	25 57 22.56	25 57 21.50	.....	.....	.....	.....	25 57 23.38	25 57 23.30
Latitude by a mean of each pair	25 57 22.18	25 57 21.02	25 57 21.83	25 57 22.86	25 57 21.78	25 57 20.04	25 57 22.49	25 57 23.19

TABLE XV—Continued.

Date.	9th pair. B. A. C. 6087 N. 6106 S.	10th pair. B. A. C. 6365 N. 6482 S.	11th pair. B. A. C. 6365 N. 6528 S.	12th pair. G. C. 1805 N. 1850 S.	13th pair. G. C. 1805 N. 1852 S.	14th pair. G. C. 1710 N. 1756 S.	15th pair. B. A. C. 6744 N. 6777 S.	16th pair. B.A. C. 6851 N. 6868 S.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
August 5, 1853	25 57 23.56	25 57 20.52	25 57 21.88	.....	.....	25 57 21.85	.....	25 57 24.30
6, 1853	25 57 21.70	.....	.....	25 57 23.75	25 57 23.45	25 57 20.44	25 57 23.27	.....
7, 1853	25 57 22.90	25 57 20.05	25 57 21.17	25 57 22.67	25 57 23.07	25 57 20.54	25 57 21.09	25 57 21.12
9, 1853	25 57 21.94	25 57 18.98	25 57 20.71	.....	25 57 23.09	25 57 19.64	25 57 20.66	25 57 22.97
10, 1853	25 57 22.25	25 57 19.29	25 57 20.90	.....	25 57 24.24	25 57 20.82	.....	.....
11, 1853	25 57 22.86	25 57 21.15	25 57 22.13	.....	25 57 22.47	25 57 20.19	25 57 20.93	25 57 21.52
16, 1853	25 57 22.00	25 57 19.40	25 57 19.85	.....	25 57 22.22	25 57 19.35	.....	25 57 21.97
17, 1853	25 57 22.80	25 57 21.56	25 57 22.03	.....	25 57 23.83	25 57 20.69	25 57 21.17	25 57 22.63
18, 1853	25 57 21.60	25 57 20.92	25 57 22.00	.....	25 57 23.71	25 57 19.82	25 57 21.45	25 57 22.70
Latitude by a mean of each pair	25 57 22.32	25 57 20.33	25 57 21.33	25 57 23.30	25 57 23.26	25 57 20.37	25 57 21.49	25 57 22.46

TABLE XV—Continued.

Date.	17th pair. B. A. C. 7232 S. 7254 N.	18th pair. B. A. C. 7383 N. 7641 S.	19th pair. B. A. C. 7559 N. 7796 S.	20th pair. B. A. C. 7565 N. 7963 S.	Results for lat. by a mean of each night, (deci'ns corrected.)	1st result. Lat. by a mean of all the pairs, (dec. corr'd.)	2d result. Lat. by a mean of all the obs., (dec. corr'd.)	3d result. Lat. by a mean of results for each night, (dec. corr'd.)	Final result. Being a mean of 1st, 2d, and 3d results.
	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″
August 5, 1853	.....	.....	.....	.....	25 57 22.26				
6, 1853	25 57 21.99	25 57 23.18	25 57 21.54	25 57 22.85	25 57 22.27				
7, 1853	25 57 21.60	25 57 22.09	25 57 20.10	25 57 22.34	25 57 21.52				
9, 1853	25 57 19.76	25 57 22.06	25 57 21.09	25 57 22.71	25 57 21.45				
10, 1853	25 57 22.96	25 57 22.82	25 57 21.63	25 57 22.36	25 57 21.65				
11, 1853	25 57 21.54	25 57 22.60	25 57 21.85	.....	25 57 21.85				
16, 1853	25 57 21.18	.....	.....	.....	25 57 21.09				
16, 1853	25 57 21.60	.....	.....	.....	25 57 22.18				
18, 1853	25 57 21.85	.....	.....	.....	25 57 22.07				
Lat. by a m'n of each pair	25 57 21.47	25 57 22.54	25 57 21.24	25 57 22.56		25 57 21.89	25 57 21.78	25 57 21.89	25 57 21.83

Latitude of astronomical station at the mouth of Rio Bravo..... = 25° 57′ 21″.83

E.

Table of latitudes and longitudes of points on and near the boundary between the U. States and Mexico.

Station.	Latitude north.	DETERMINED.		Long. west of Greenwich.	DETERMINED.		Observer.
		When.	How.		When	How.	
	° ′ ″			° ′ ″			
Camp Riley, (Major Emory's Astronomical Observatory.)	32 35 43.53	1849	Zenith telescope...	117 06 29.7	1849	Moon culminations.	W. H. Emory.
"East Base" Station	32 35 42.33	1849	Triangulation from Camp Riley.	117 06 29.7	1849	Triangulation from Camp Riley.	Do.
"West Base" Station	32 34 33.10	1849	....do.....	117 09 03.23	1849	....do.....	Do.
Monument No. 1, marking the initial point of boundary.	32 31 59.63	1849	....do.....	117 08 29.7	1849	....do.....	Do.
Monument No. 2, (Station 4)	32 32 25.2	1849	....do.....	117 03 31.7	1849	....do.....	Do.
Station No. 1	32 33 11.8	1849	....do.....	116 53 05.9	1849	....do.....	Do.
Station No. 7	32 34 02.0	1849	....do.....	116 44 17.6	1849	....do.....	Do.
Boundary Peak (A.)	32 36 35.9	1849	....do.....	116 18 14.6	1849	....do.....	Do.
Camp 118, (San Pasqual)	33 03 42.0	1846	Sextant	117 06 42.2	1846	Sextant.....	Do.
Camp 114, (near Warner's Ranch)	33 16 57.0	1846	....do.....	116 41 56.2	1846	....do.....	Do.
Camp 112, (Vallecito)	32 58 15.0	1846	....do.....	116 23 53.2	1846	....do.....	Do.
Camp 111 (Carrizo Creek)	32 52 33.0	1846	....do.....	116 00 22.2	1846	....do.....	Do.
First Wells	32 40 22.0	1846	....do.....	114 00 28.0	1846	....do.....	Do.
Station 46, (left bank of Rio Colorado, below junction of Rio Gila.)	32 43 48	1851	....do.....	114 39 58.2	1851	....do.....	Lieut. Whipple, Top. Engineers.
New initial point of boundary on Rio Colorado, 20 miles below the mouth of Rio Gila.	32 29 44.45	1855	Zenith telescope...	114 48 44.53	1855	Triangulation from mouth of Gila.	Lieut. Michler, Top. Engineers.
Monument (pyramid of cast iron) on Sonora line, near the Colorado.	32 29 01.48	1855	Triangulation from initial point.	114 46 14.43	1855	Triangulation from initial point.	Lieut. Michler.
Quitobaquita	31 56 26.57	1855	Zenith telescope....	112 59 25.73	1855	Moon culminations.	Capt. Jimenez.
Junction of Gila and Colorado	32 43 32.3	1849	Triangulation from observatory.	114 36 09.9	1849	Triangulation from observatory.	W. H. Emory.
Station No. 7, on Rio Gila	32 43 56.8	1852	Sextant.....	114 25 33.7	1852	By survey	Do.
Station No. 8, on Rio Gila	32 44 29.2	1852	....do.....	114 19 35.7	1852	....do.....	Do.
Camp 105, on Rio Gila, (Emory's Recon.)	32 43 17	1846	....do.....	.....	.....	.....	Do.
Station No. 9, on Rio Gila, (Emory's Reconnaissance.)	32 41 36.3	1852	....do.....	114 17 32.5	1852	By survey.....	Lieut. Whipple, Top Engineers.
Station No. 10, on Rio Gila	32 40 25.2	1852	... do.....	114 13 20.0	1852	By survey	Do.
Station No. 11, on Rio Gila	32 41 49.3	1852	....do.....	114 00 33	1852	....do.....	Do.
Station No. 12, on Rio Gila	32 42 39.7	1852	....do.....	113 58 15	1852	....do.....	Do.
Camp 103, on an island in the Gila, (Emory's Reconnaissance.)	32 43 38	1846	....do.....	.....	.....	.....	W. H. Emory.
Station No. 13, on Rio Gila	32 46 02.5	1852	....do.....	113 46 59	1852	By survey	Lieut. Whipple.
Station No. 14, on Rio Gila	32 46 44.8	1852	....do.....	113 44 22	1852	....do.....	Do.
Station No. 15, on Rio Gila	32 49 40.8	1852	....do.....	113 36 45	1852	....do.....	Do.
Camp No. 101, on Rio Gila. (Emory's Reconnaissance.)	32 55 52	1846	....do.....	.....	.....	.....	W. H. Emory.
Station No. 16, on Rio Gila	32 55 56.4	1852	....do.....	113 18 54	1852	....do.....	Lieut. Whipple
Station No. 17, of 1852, on Rio Gila, or station No. 42, of 1851.	32 58 58.6	1851-2	....do.....	113 11 15	1851-2	....do.....	Do.
Camp 99, on Rio Gila, (Emory's Reconnaissance.)	32 59.22.0	1846	....do.....	.....	.....	.....	W. H. Emory.
Camp 97, between Pimos and Coco Maricopas Villages, (Emory's Reconnaissance.)	33 09.28.0	1846	....do.....	.....	.....	.....	Do.
Camp 95, on the Gila, (Emory's Reconnaissance.)	33 04 21.0	1846	....do.....	.....	.....	.....	Do.
Camp 93, on Rio Gila, (Emory's Reconnaissance.)	33 05 40.0	1846	....do.....	.....	.....	.....	Do.
Camp 91, on the San Pedro, near its mouth, (Emory's Reconnaissance.)	32 57 43.0	1846	....do.....	.....	.....	.....	Do.
Camp 89, Disappointment Creek, (Emory's Reconnaissance.)	33 14 54.0	1846	....do.....	.....	.....	.....	Do.
Camp 87, on the San Francisco, about two miles from its mouth, (Emory's Reconnaissance.)	33 14 29.0	1846	....do.....	.....	.....	.....	Do.

E.—*Table of Latitudes and Longitudes*—Continued.

Station.	Latitude north.	DETERMINED. When.	DETERMINED. How.	Long. west of Greenwich.	DETERMINED. When.	DETERMINED. How.	Observer.
	° ′ ″			° ′ ″			
Camp 86, on the San Francisco, about two miles from its mouth, (Emory's Reconnaissance.)	33 19 10.0	1846	Sextant				W. H. Emory.
Camp 83, on Rio Gila, (Emory's Reconnaissance.)	32 53 16.0	1846	....do				Do.
Camp 81, on Rio Gila, (Emory's Reconnaissance.)	32 44 52.0	1846	....do				Do.
Camp 80, on Rio Gila, (Emory's Reconnaissance.)	32 38 13.0	1846	....do				Do.
Camp 78, first camp on the Rio Gila, (Emory's Reconnaissance.)	32 50 08.0	1846	....do				Do.
Camp 77, Night Creek, (Emory's Reconnaissance.)	32 50 54.0	1846	....do				Do.
Copper Mines	32 47 53.1	1851	....do	108 04 39.7	1851	Sextant	Lieut. Whipple.
Camp 75, in the mountains, between the del Norte and Copper Mines, (Emory's Reconnaissance.)	32 42 11.0	1846	....do				W. H. Emory.
Camp 73, first camp after leaving Rio del Norte, (Emory's Reconnaissance.)	32 55 04.0	1846	....do				Do.
Camp 70, east bank of Rio del Norte, (Emory's Reconnaissance.)	33 20 02.0	1846	....do				Do.
Camp 68, west bank of Rio del Norte, (Emory's Reconnaissance.)	33 41 19.0	1846	....do				Do.
Camp 65, west bank of Rio del Norte, about two miles below Lamitar, (Emory's Reconnaissance.)	34 07 39.0	1846	....do				Do.
Camp 62, a little south of and about one mile west of Peralta, (Emory's Reconnaissance.)	34 48 33.0	1846	....do				Do.
Camp at Peralta, near Señora Chavis's private chapel, (Emory's Reconnaissance.)	34 50 57.0	1846	... do				Do.
Albuquerque	35 05 51.0	1853	....do	106 37 52.0	1853	Moon's culminat'n.	Lieut. Whipple.
Camp on the Rio del Norte, near the Alameda, (Emory's Reconnaissance.)	35 11 20.0	1846	....do				W. H. Emory.
Camp on the Rio del Norte, about one mile below San Felipe, (Emory's Reconnaissance.)	35 25 30.0	1846	....do				Do.
Camp Santa Fe, (Emory's Reconnaissance.)	35 41 06.0	1846	....do				Do.
Lieutenant Whipple's astronomical station, near Doña Ana.	32 22 13.4	1851	Transits over prime vertical.	106 50 11.25	1851	Signal flashes simultaneously obser'd at Frontera.	Lieut. Whipple.
Doña Ana (church)	32 23 13.8	1851	Survey	106 48 32.5	1851	Survey	Do.
Initial point of parallel 32° 22′ in the channel of Rio Bravo.	32 22 00.0	1851	Triangulation from astronom'l station.	106 50 56.25	1851	Signal flashes	Do.
First monument west of Rio Bravo, on parallel 32° 22′.	32 22 00.0	1851	....do		1851	Triangulation from astronom'l station.	Do.
Station No. 5 (near parallel 32° 22′)	32 22 03.8	1851			1851	Flashes of gunpowder.	Do.
Station No. 8....do.....do	32 22 13.4	1851			1851	....do	Do.
Station No. 9....do.....do	32 22 20.7	1851			1851	....do	Do.
Station No. 11....do.....do	32 22 25.6	1851			1851	....do	Do.
Station No. 12....do.....do	32 22 31.1	1851		108 04 50	1851	....do	Do.
Ojo de Inez	32 25 18.5	1851	Sextant		1851	Sextant	Do.
Sugar Loaf Camp, south of Station No. 18, on parallel 32° 22′.	32 20 21.8	1851	....do	109 01 16.3	1851	....do	Do.
Camp Reed	32 05 09.6	1851	....do	109 02 17	1851	....do	Do.
Dry Camp	32 08 33.8	1851	....do	109 11 45	1851	....do	Do.
Camp near Dos Cabazas del Chiricahui	32 08 43.7	1851	....do	109 24 45	1851	....do	Do.
General Conde's Camp, Salt Lake, September 6th and 7th.	32 03 54.0	1851	....do	109 47 10	1851	....do	Do.

E.—*Table of Latitudes and Longitudes*—Continued.

Station.	Latitude north.	DETERMINED. When	How.	Long. west of Greenwich.	DETERMINED. When	How.	Observer.
	° ′ ″			° ′ ″			
Camp, Salt Lake Spring, October 14, 1851.	32 02 38.8	1851	Sextant.....	.....	1851	Sextant.....	Lieut. Whipple.
Señor Salazar's terminal point of parallel 32° 22′.	32 22 01.0	1851	.....	109 50 56.25	1851	Moon culminations.	Do.
Camp near terminal point.....	32 22 06.6	1851	Sextant.....	109 50 15.75	1851	Sextant.....	Do.
Castro Spring.....	32 25 54.6	1851	....do.....	109 48 35.9	1851	....do.....	Do.
Pools in valley of Saos, bed of Rio Santo Domingo.	32 40 05.7	1851	....do.....	109 33 20	1851	....do.....	Do.
Quercus Cañon.....	31 56 15.0	1851	....do.....	110 08 35.0	1851	...do.....	Do.
First station on Rio San Pedro.....	31 54 31.2	1851	....do.....	110 11 52.0	1851	....do.....	Do.
San Pedro Springs.....	31 50 52.0	1851	....do.....	110 12 16.5	1851	Moon culminations.	Do.
Tucson astronomical station.....	32 12 32.0	1852	....do.....	110 53 10.0	1852	Sextant.....	Do.
Tucson (church).....	32 12 54.5	1852	Survey.....	110 52 55	1852	....do.....	Do.
Station 6 miles north of Tubac.....	31 41 58.53	1852	Sextant.....	110 57 06	1852	....do.....	Do.
Tubac.....	.....	1852	Survey.....	110 57 50	1852	....do.....	Do.
Station near the mission of Tomocacori..	31 34 47.16	1855	Sextant.....	110 56 57.90	1855	....do.....	Capt Jimenez.
Ojo del Sopori.....	31 43 54.89	1855	....do.....	.....	.....	.....	
Bamori.....	31 39 40.87	1855	....do.....	111 11 04.05	1855	Sextant.....	Do.
Hacienda of Aribaca.....	31 35 09.30	1855	....do.....	111 14 12.60	1855	....do.....	Do.
Las Boquillas.....	31 39 27.15	1855	....do.....	.....	1855	....do.....	Do.
Near the Sierra de la Arteza.....	31 53 06.76	1855	....do.....	.....	1855	....do.....	Do.
Station upon the road, July 15th.....	31 46 58.64	1855	....do.....	111 47 03.45	1855	....do.....	Do.
Station upon the road between Cobota and Sierra de la Nariz.	31 43 37.03	1855	....do.....	112 14 02.55	1855	....do.....	Do.
Station upon the road, July 18th.....	31 52 24.74	1855	....do.....	.....	.....	.....	Do.
Altar (Sonora).....	30 42 44.26	1854	....do.....	111 44 12.0	1854	....do.....	Do.
* Los Nogales.....	31 21 00.1	1855	Zenith telescope...	110 51 02.1	1855	Moon culminations.	J. H. Clark.
Astron'l station at head of Santa Cruz river	31 17 56.28	1855	....do.....	.....	.....	.....	Do.
Santa Cruz, (church).....	31 13 22.5	1852	Survey from astronomical station.	110 30 27.5	1855	Survey.....	Lat. by Lt. Whipple and long. by the survey of United States boundary commission.
Agua Prieta Ravine.....	31 18 23.5	1852	Sextant.....	109 33 35.0	1855	....do.....	Do. do.
San Bernardino.....	31 19 40.35	1855	Zenith telescope...	.....	.....	.....	J. H. Clark.
San Luis Spring.....	31 20 32.88	1855	.....do.....	.....	.....	.....	Do.
Agua del Perro.....	31 20 57.56	1855	.....do.....	.....	.....	.....	Do.
Espia.....	31 20 56.43	1855	.....do.....	.....	.....	.....	Do.
Carrizalillo.....	31 50 55.26	1855	.....do.....	.....	.....	.....	Do.
Janos.....	30 52 00.0	1852	Sextant.....	.....	.....	.....	Lieut. Whipple.
Corralitos.....	30 42 25.0	1852	..... do.....	.....	.....	.....	Do.
Fort Fillmore, (astronomical station).....	32 13 34.8	1852	....do.....	.....	1852	Survey.....	W. H. Emory.
Fort Fillmore, (officers' quarters).....	32 13 38.5	1852	Survey from astronomical station.	106 42 15.0	1852	....do.....	Do.
Frontera, (Maj. Emory's observatory)....	31 48 44.31	1852	Zenith telescope...	106 33 04.5	1851-2	Moon culminations.	Do.
Astronomical station, near initial point of boundary, (parallel 31° 47′.)	31 04 00.0	1854-5	.....do.....	.....	.....	.....	J. H. Clark.
Initial point in river, on parallel 31° 47′...	31 47 00.0	1855	.....do.....	106 31 20.8	1855	Triangulation from Frontera.	Do.
Monument near initial point, on right bank of river.	31 47 00.0	1855	.....do.....	106 31 23.5	1855	.....do.....	Do.
El Paso del Norte, (Salazar's observatory)	31 44 15.7	.....	.....	106 29 05.4	1852	Signal flashes simultaneously observed at Frontera.	†Long. by W. H. Emory, lat. by Señor Salazar.
El Paso del Norte, (cathedral).....	31 44 15.7	.....	.....	106 29 00.0	1852	.....do.....	Do. do.
San Elceario, (observatory).....	31 35 12.69	1851	Transits over prime vertical.	106 16 15.0	1852	Moon culminations.	Lieut. Smith.
San Elceario, (cathedral).....	31 35 02.3	1851	.....do.....	106 16 13.8	1852	.....do.....	W. H. Emory.
Mouth of Cañon, (Major Emory's observatory.)	31 02 26.15	1852	Zenith telescope...	105 37 15.0	1852	Flashes of gunpowder simultaneously obs. at San Elceario.	Do. do.

*Since this point was established, the corresponding observations at Greenwich observatory have been furnished in manuscript by Prof. Airy, Astronomer Royal; and the result deduced therefrom is 7h. 23m. 35s.3, showing a difference of 11s.2 from the adopted longitude.

† Moon culminations also observed by Salazar, and resulting longitude found to correspond.

W. H. E.

E.—*Table of Latitudes and Longitudes*—Continued.

Station.	Latitude North.	Determined.		Longitude West of Greenwich.	Determined.		Observer.
		When.	How.		When.	How.	
	° ′ ″			° ′ ″			
Near mouth of Cañon, where San Antonio road strikes the Rio Bravo.	31 02 25.4	1852	Survey from astronomical station.	105 37 23.7	1852	Survey from astronomical station.	W. H. Emory.
Presidio del Norte, (Major Emory's observatory, opposite.)	29 34 07.13	1852	Zenith telescope...	104 24 45.3	1852	Moon's culminat'ns.	Do.
Presidio del Norte, (cathedral)	29 33 53.12	1852	do	104 26 27.7	1852	Triangulation from observatory.	Salazar.
Camp No. 1, (Lieut. Michler's, Station No. 91, survey of Rio Bravo del Norte.)	29 47 19.9	1853	Sextant	102 17 21.0	1853	Survey	Lieut. Michler.
Camp No. 3, Station No. 130	29 48 41.2	1853	do	102 04 19.0	1853	do	Do.
Camp No. 4, Station No. 171	29 48 36.8	1853	do	101 51 52.0	1853	do	Do.
Camp No. 5, Station No. 211	29 46 18.3	1853	do	101 41 05.0	1853	do	Do.
Camp No. 6, Station No. 294	29 45 08.6	1853	do	101 26 29.0	1853	do	Do.
Camp No. 7, Station No. 325, opposite mouth of Rio Pecos.	29 41 45.5	1853	do	101 19 35.0	1853	do	Do.
Camp No. 12, above Eagle Pass	28 43 03.2	1853	do	100 30 24.0	1853	do	Do.
Fort Duncan, (observatory)	28 42 43.67	1852	do	100 30 26.7	1852	Moon's culminat'ns.	W. H. Emory's longitude, and Lt. Michler's latitude.
Fort Duncan, (flag-staff)	28 42 16.4	1852	do	100 30 19.3	1852	do	Do. do.
Falls of Presidio de Rio Grande	28 16 11.5	1853	do		1852		Lieut. Michler.
Fort McIntosh, (astronom'l station, near)	27 30 22.75	1852	do	99 28 47.0	1852	Survey	W. H. Emory.
Fort McIntosh	27 30 08.9	1852	do	99 29 07.0	1852	do	Do.
Redmond's Ranch, or Bellville	26 52 06.8	1853	do	99 17 27.0	1853	Sextant	Do.
Roma	26 24 20.8	1853	do	98 59 17.0	1853	do	Do.
Ringgold barracks, (observatory)	26 22 27.8	1853	Zenith telescope	98 46 39.85	1853	Moon's culminat'ns.	Do.
Ringgold barracks, (flag-staff of garrison.)	26 22 30.5	1853	do	98 46 37.93	1853	do	Do.
Edinburgh	26 05 53.9	1853	Sextant	98 13 37.5	1853	Sextant	Do.
Reynosa, Mexico, (church steeple)	26 05 34.1	1853	Survey	98 14 22.4	1853	Survey	Do.
Old Fort Brown	25 53 16.3	1853	Sextant	97 26 22.5	1853	do	Do.
Observatory near mouth of Rio Bravo	25 57 21.89	1853	Zenith telescope	97 07 37.5	1853	Moon's culminat'ns.	Do.
Northern point at mouth of Rio Bravo	25 57 18.20	1853	do	97 07 22.5	1853	do	Do.
Mouth of Rio Bravo	25 57 10.0			97 07 17.0	1853	do	Do.
Camp west of, and near, Fort Inge, Texas	29 10 18.4	1851	Sextant	99 47 12.0	1853	Survey	Do.
Camp on Leona river, 15,000 feet north of Fort Inge, Texas.	29 12 47.1	1850	do				Lieut. Whipple.
Fort Inge, Texas	29 10 18.4	1851	do	99 47 10.0	1853	Survey	W. H. Emory.
Near Turkey creek	29 13 46.0	1850	do				Lieut. Whipple.
Las Moras	29 18 35.0	1850	do				Do.
Rio San Pedro, (1st crossing)	29 29 21.6	1852	do	100 57 35.0	1852	Survey	Lieut. Michler.
Devil's Camp	29 57 02.0	1850	do				Lieut. Whipple.
Devil's River Valley	30 03 52.1	1850	do				Do.
Camp XV, where road leaves San Pedro going to El Paso.	30 10 38.4	1851	do				W. H. Emory.
Camp Steel	30 23 59.6	1850	do	101 11 13.2	1850	Sextant	Lieut. Whipple.
Howard's Spring	30 28 00.5	1850	do	101 27 15.0	1850	do	Do.
Camp on Rio Pecos	30 59 59.5	1850	do				Do.
Camp where road leaves Rio Pecos, going west.	30 58 48.0	1851	do				W. H. Emory.
Escondido creek	30 52 23.0	1850	do				Lieut. Whipple.
Camanche Spring	30 52 58.5	1850	do				Do.
Leon Spring	30 53 33.1	1850	do	103 04 13.0	1850	Survey	Do.
Prairie Camp	30 49 01.7	1850	do				Do.
Limpia Camp	30 44 51.0	1850	do				Do.
Limpia, (Vallecito)	30 41 26.0	1850	do				Do.
Alamo Grove	30 36 30.6	1850	do				Do.
Camp on the Tascite	30 19 51.0	1852	do	104 14 48.0	1852	Sextant	W. H. Emory.
Snow Camp	30 36 28.7	1850	do				Lieut. Whipple.
Dead Man's Hole	30 40 49.9	1850	do	104 22 05.5	1850	Sextant	Do.
Well's Camp	30 53 17 5	1850	do				Do.
Eagle Spring	30 59 58.5	1850	do				Do.
Dry Camp	31 03 58.2	1850	do				Do.

CHAPTER IX.

METEOROLOGY.

SIR: The meteorological notes taken during the march from San Antonio to El Paso, during the latter part of 1850, though sufficiently interesting of themselves, do not furnish data for averaging the temperature, &c., and therefore cannot be recorded in the same form as that adopted for the publication of observations taken at a fixed observatory.

The principal and most interesting portion of the observations is the result deduced and embodied in the barometrical profile of the road already prepared.

The record of both wet and dry bulb thermometers was carefully kept. The highest degree noted was on the 23d October, 1850, at 3 P. M., eighty-four degrees; while the lowest was at sunrise of the 6th of December, of the same year, when the mercury fell to 1°.5 Fahrenheit. These results are interesting only so far as noting these two extreme points. From the nature of the marches made, it was impossible to note with any regularity the daily change in any of the instruments.

The chief phenomena noted are those of a local character. The effect of the different ranges of mountains and the long succession of arid plains upon the condition of the atmosphere is shown by the markings of the hygrometer. In passing from the shores of the Gulf to San Pedro, or Devil's river, but little change takes place—the same succession of dews, the usual quantity of rain, and, indeed, all the characteristics of a climate enjoying its proper share of humidity are met with. The clouds of the usual forms, cirrus and nimbus, float about, and nothing as yet gives notice that we are approaching a different country. One single day's march, and this is perceptibly changed. The summit of the valley of the San Pedro reached, the hygrometrical condition of the atmosphere is altered at once, the appearance of the vegetation is different, and the whole face of the country shows the effect of the diminution of moisture so accurately and so immediately pointed out by the hygrometer. We cannot speak with certainty of the effect of the change on any of the instruments except the hygrometer; but that the barometer is seriously affected there can be no doubt, though to what extent can only be told by more perfect unhurried examinations. The observations point out the existence of such a change; they show, too, the line of country at which the change commences; and it only remains to fix the exact amount of correction to be used, to make the barometer as useful in these regions as in those countries bordering on the seacoast, or where the great lack of humidity is not so sensibly felt.

During the march, there was experienced a norther of the most perfect character; this occurred on the 4th and 6th of December, and it was at the latter date that the lowest temperature was noted.

The norther commenced at 4 P. M. of the 4th December, and was preceded by no change by which its approach could be predicted. A calm, pleasant day, with the thermometer ranging

from 40° to 70° Fahrenheit, was ended by a sudden rising of the wind from the southwest; this changed to the northeast, and blew heavily from that quarter for more than twenty-four hours; during this time the thermometer fell to 1°.5 Fahrenheit, and snow fell to the depth of one inch and a half.

The cold weather lasted for about three days, and a most delightful calm succeeded the severest norther noted in the record. A few days after this, the regular observations were taken up and continued at San Elcearío and Frontera; those results, reduced for one year to the form adopted for publication, will be more interesting than these under discussion can be made.

The appearance of the clouds varies so little that it forms no meteorological feature of sufficient importance to be accurately noted. The changes, as might be expected, are from the forms in which a certain degree of moisture necessarily enters to those in which the appearance is that of a fleecy mass of cotton without shape. These last are so far removed from the earth's surface as to be almost entirely out of the influence of the currents of wind indicated by the weather-vanes. Their formation seems gradual, and the increase in size is apparently due to a decrease in the distance. They came and vanished sometimes from the same spot in the heavens; and for weeks together scarcely one "direction" due to the course of the wind could be noted. In watching them carefully, their volume would seem to be lessened or increased, and yet the parts detached could not be seen to float away, nor was there any approach of additional vapor to be seen by which the size of the cloud could be increased.

The character of the winds, with their force and direction, was carefully noted; in particular their effect on the barometer was the subject of repeated observations. The results of these observations are more accurately noted in another place. And though the effect produced was first noticed on the march, yet subsequent observations at the fixed observatory only served to strengthen and confirm the opinion which was at that time advanced as to the effect of any change from east to west, or *vice versa*, on the barometrical column.

The records of the observations taken at the fixed observatories at San Elcearío and Frontera are given fully for one year. These observations were made in the immediate valley of the Rio Grande, and show the changes in the different instruments noted. With regard to the value to be placed on the observations for humidity, it should be observed that the time embraced in the record was one of great freedom from moisture, both at the points observed and at situations on the river far above the observatory. The river during the summer of 1851* was nearly dry in several places in our immediate vicinity, a slight current only marking its progress near Frontera, while its bed served as the best road thence to El Paso.

The chart prepared to accompany this report shows at a glance the most important results deduced from our observations.

The results given in the separate columns of the tabulated forms are deduced from six daily observations, viz: at sunrise, 9 A. M., noon, 3 P. M., sunset, and 8 P. M. During the long days of summer this last hour was changed to 9 P. M., thus making the interval between sunset and the time of the last evening observation more nearly equal in the different seasons.

The columns in which are noted the daily means for thermometer and dew-point observations

* The year 1851 was notoriously a dry year in all the northern States of Mexico, and so far the selection of that year is unfortunate as affording a measure of the average rain, but it happened to be the only year when a single observer was stationary for any length of time at the same place.

W. H. E.

will, of course, present different records from those which would have been shown had the results merely been deduced from the two daily extremes of heat and cold, or the dew-points calculated from those observations only.

In addition to all these observations, the 21st day of each month, as the regular meteorological term-day, was carefully noted by the record of observations for each hour of the twenty-four.

The remainder of the meteorological data serves in a great measure merely for the calculation of the elevation of points on the line of survey or travel. These results will be found embodied in the different profiles of the country over which the line passed.

The observations of 1855, by a careful comparison with others of the same character, taken simultaneously at different places, have enabled me to establish the height of the initial point of the boundary on the Rio Grande in a manner that must be more satisfactory than any yet adopted.

This elevation varies slightly from that of El Paso.

In the computation for elevation I have used the French formula of Delcros, and have employed some other corrections consequent upon the value of horary variation, founded on the observations for that quantity taken at San Elceario. In most instances, however, the points of observation were too remote from the fixed observatory for the horary correction to be of any great value. In these the usual corrections for temperature, &c., only were used.

The effect of the direction and force of the wind on the mercury of the barometer has been referred to above, and I mention it here only to state that my observations on this subject were sufficient to assure me of the great necessity of noticing these values in connexion with the barometer more particularly when observations are being made for altitude. The exact value of the quantity I have not ascertained, but that it exists I am confident; and I trust that future and more prolonged observations will fix the value in a manner sufficiently accurate for its use as a correction in barometrical computations.

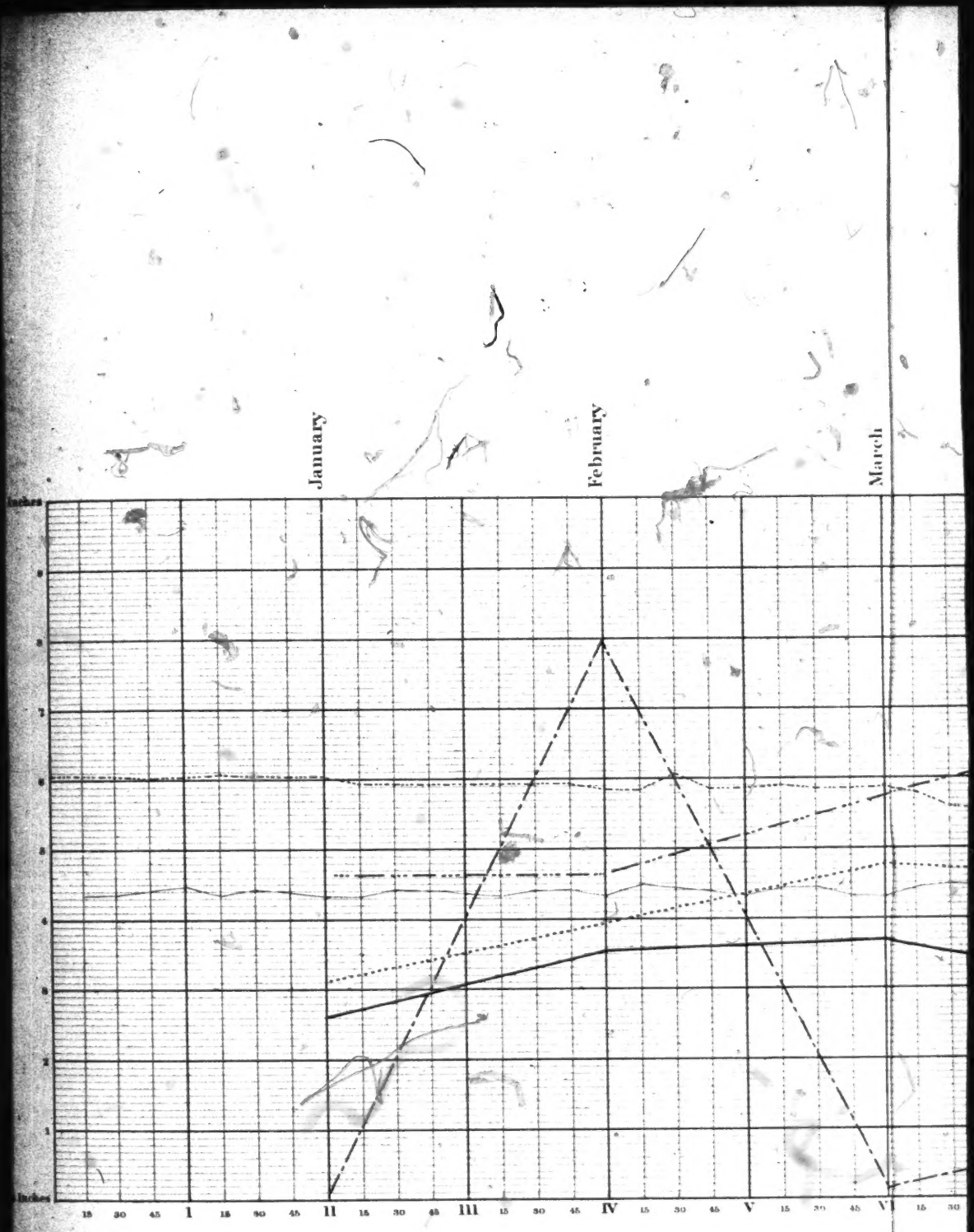
All of which is respectfully submitted by your obedient servant,

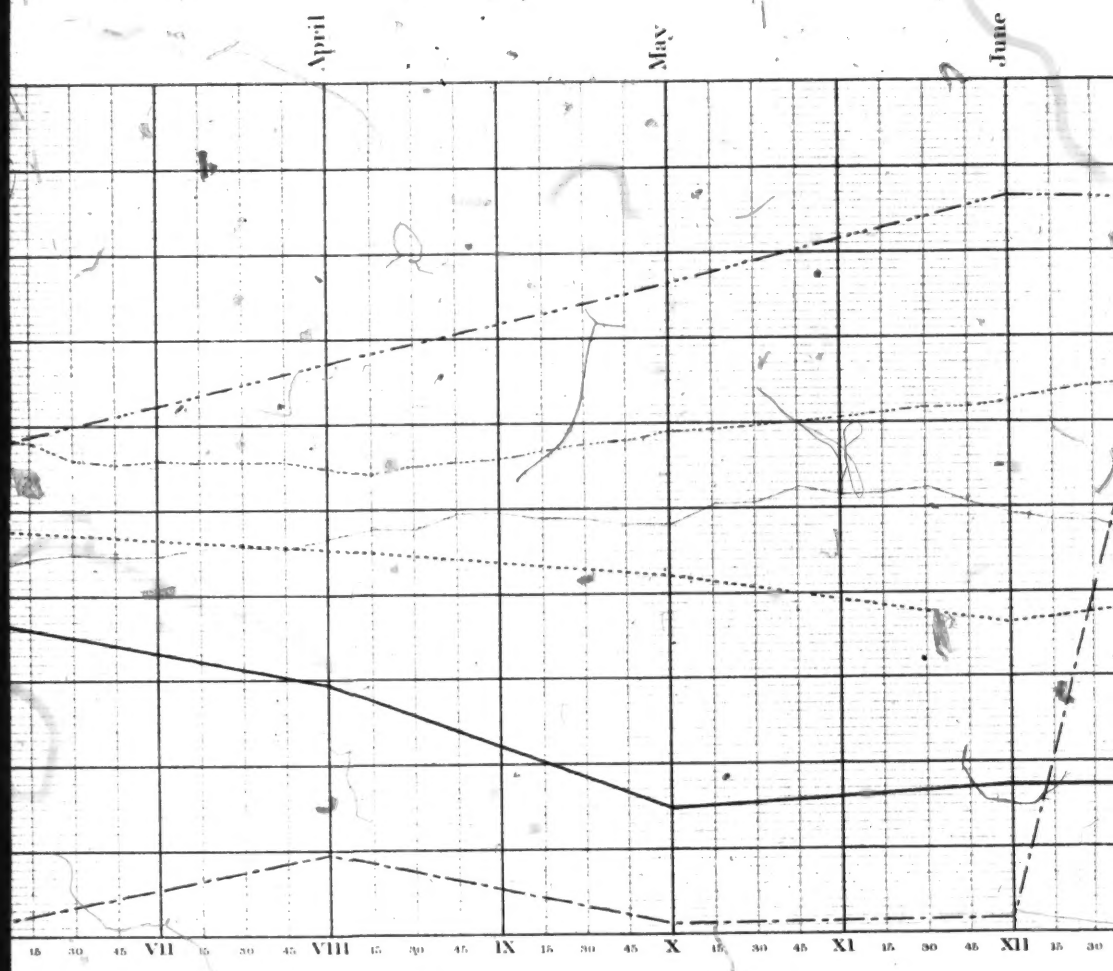
MARINE T. W. CHANDLER,
Assistant in charge of Meteorological Department.

Major WILLIAM H. EMORY, 1*st Cavalry U. S. A.*,
Commissioner United States and Mexican Boundary Survey.

NOTE.—Of the immense mass of materials collected, showing the meteorological character of the country adjacent to the boundary line, I have deemed it proper to produce here only a short abstract from the tables. Those who may desire further information can obtain it by reference to the records filed in the Department of the Interior.

W. H. E.


January
February
March
Inches
Inches
15 30 45 I 15 30 45 II 15 30 45 III 15 30 45 IV 15 30 45 V 15 30 45 VI 15 30
Monthly mean of Barometer for one year
Monthly mean of Thermometer for one year
Monthly mean of Dew Point for one year
Monthly mean of Rain Guage for one year
Mean of Thermometer for each fifteen minutes of the day - for one week
Mean of Barometer for each fifteen minutes of the day - for one week



CHART

SHOWING THE RESULT

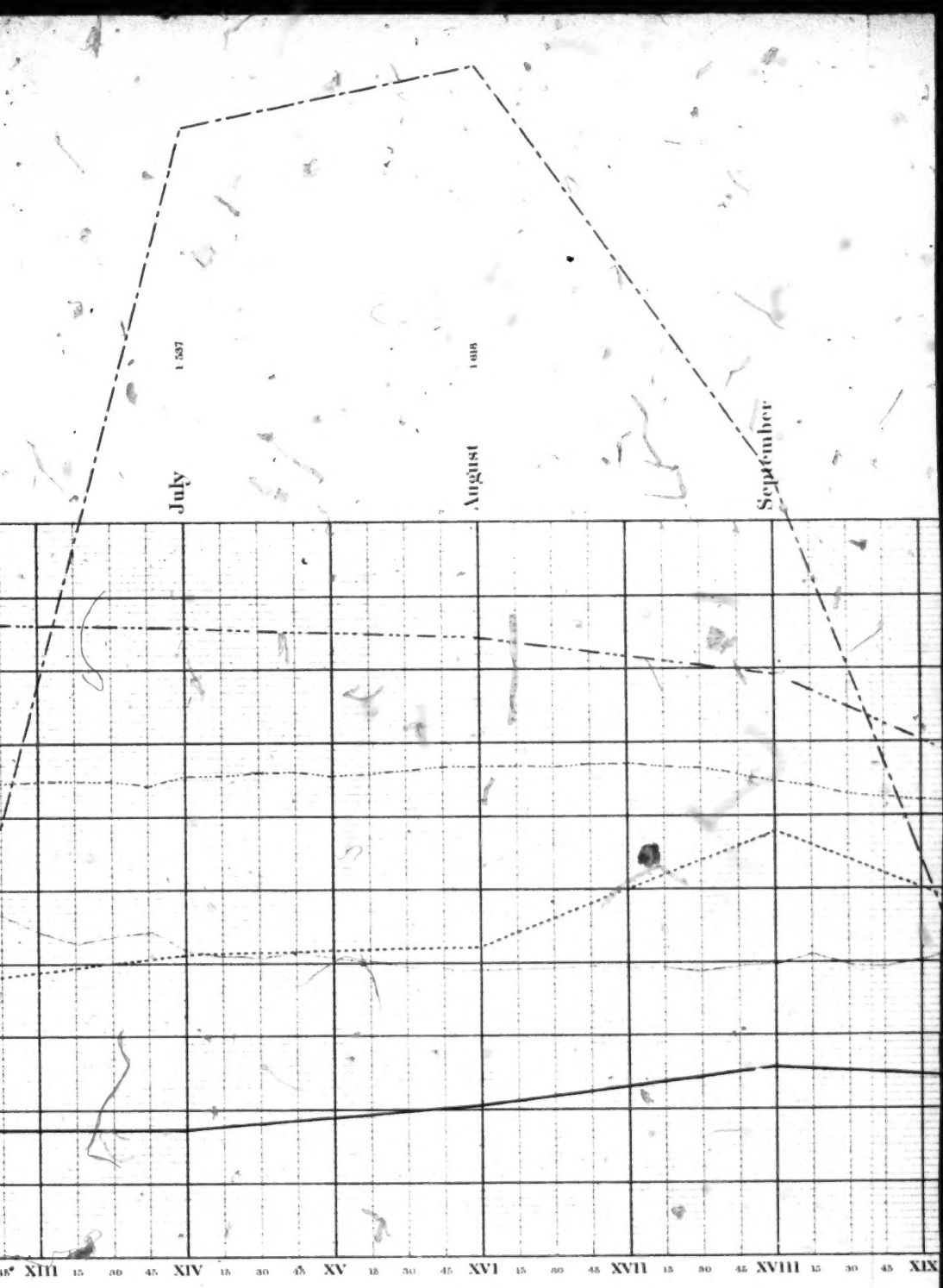
METEOROLOGICAL OBSE

FOR ONE YEAR.

Taken and reduced b

MARINE T.W.CHANDI

under the direction of Major W.



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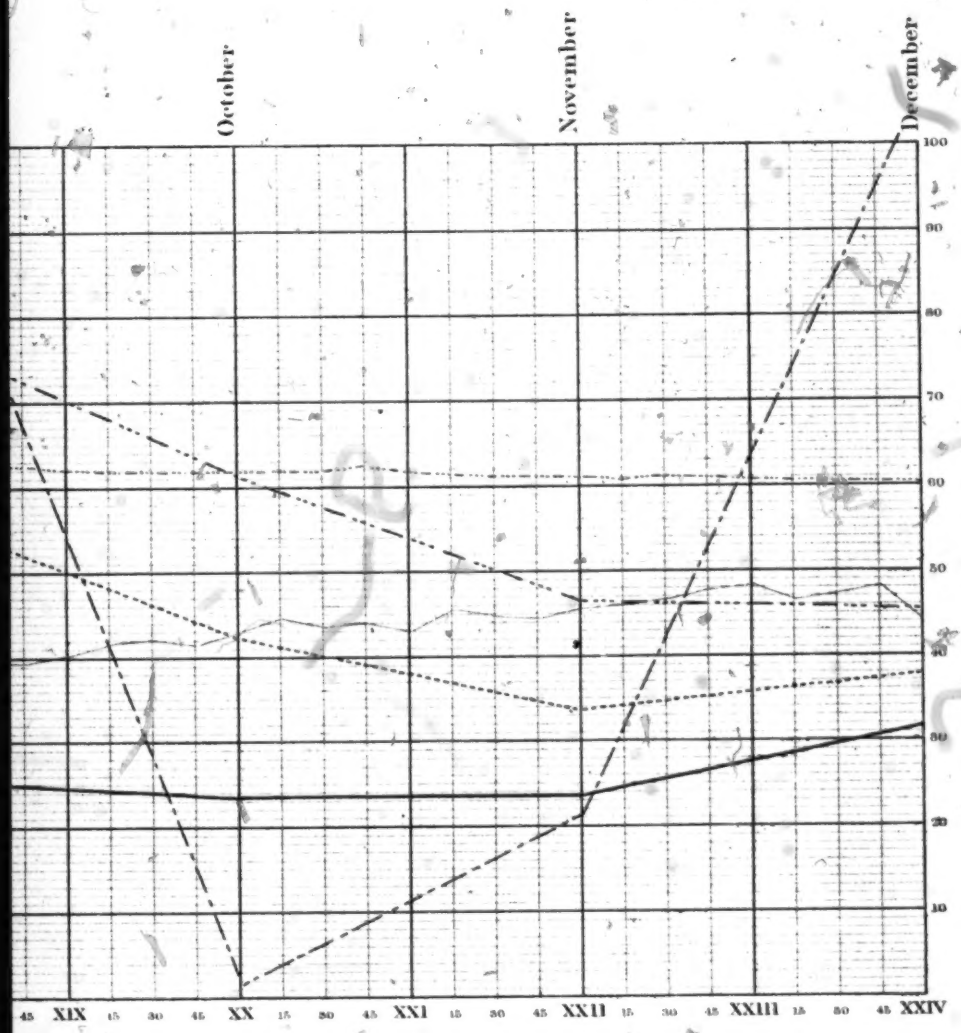


FRONTERA TEXANA 1851

Abstract of results from meteorological records.

Date.	Station.	Mean height of barometer.	Mean height of thermometer.	Dew point.	Greatest heat.	Least heat.	Rain, inches.
1851.							
January	San Elceario	26.96	48.3	31	67	47	.004
February	do	26.354	46.29	39.19			0.795
March	do	26.379	57.7	47.9	81	39.5	0.015
April	do	26.295	67	45.9	87.5	40.5	0.009
May	Frontera	26.148	76.4	49.0	95	50.5	0.013
June	do	26.173	86.8	36.6	103	59	0.016
July	do	26.174	85.9	41.2	99	71	1.537
August	do	26.206	84.1	49.1			1.613
September	do	26.254	79.13	57.69	92	65	1.059
October	do	26.233	67.6	42.1	87	47	0.013
November	do	26.233	50.8	36.6	73	25	0.211
December	do	26.317	45.5	37.7	63	27	1.255
1854.							
December	Near junction of Gila and Colorado	29.979	59.8		72	48.5	
1855.							
February	do do	29.937	68		89	53	

BAROMETRIC HEIGHTS.

	Feet.		Feet.
Fort Brown	165.5	San Elceario	3607.3
Ringgold Barracks	521.6	Initial point on Rio Bravo, parallel 31° 47′ N	3684.3
Edinburgh	422.3	Frontera	3796.3
Fort McIntosh	806.4	Neides' spring	4309.8
Eagle Pass or Fort Duncan	1461.0	Cook's spring	4777.0
San Antonio	578.7	Santa Rita del Cobre	6106.4
Castroville	671.9	Ojo de Vaca	4988.6
Quihi	855.6	Carrizalillo	4454.7
Rio Seco	936.7	Espia	4027.5
Comanche creek	923.6	Ojo de Ines or de Gavilan	5293.4
Camp near Fort Inge	910.8	Ojo del Perro	4691.7
Camp near Nueces	931.7	Alamo Hueco	4650.
Elm creek	1093.5	Ojo del Picacho	4694.3
Esquetá creek	983.0	Salt Lake, (parallel 32° 22′ N)	3994.2
San Felipe	817.9	Salt Lake spring, (playa de los Pimos)	4193.7
Painted Caves	952.4	Quercus Cañon	4169.7
Rau Pedro or Devil's river	1810.0	Camp on Gila, near Mount Graham	2976.1
Second crossing San Pedro	1843.2	Summit of San Luis mountain	5818.9
Head of San Pedro	1680.5	Ojo de San Luis	5044.0
Howard's spring	2053.5	Guadalupe Cañon	4447.8
Live Oak creek	2083.4	San Bernardino	3676.8
Pecos	2026.9	Agua Prieta	4017.0
Escondido spring	2806.1	Spring at head of Rio San Pedro, 1st branch east	4383.8
Leon spring	3098.2	Rio San Pedro, near parallel 32° 23′	3717.6
Limpia	4004.3	Summit of pass to and near Santa Cruz	5469.5
Head of Limpia	4688.4	Santa Cruz	4498.3
Eagle spring	4535.5	Los Nogales	3835.7
Station near Presidio del Norte	2779.0	Junction of Gila and Colorado	275.0
Rio Bravo (where road from San Antonio strikes it)	3484.0	New Initial Point on Colorado	156.3

MAGNETIC OBSERVATIONS.

Magnetic observations on the boundary line between the United States and Mexico, made in 1855, under the direction of Major W. H. Emory, United States commissioner under the treaty of 1853; and general discussion of the magnetic observations made in connexion with the Mexican Boundary Surveys.

RECOMPUTED BY J. E. HILGARD, UNITED STATES COAST SURVEY.

I. *Magnetic observations in* 1855.

Observations of declination, dip, and absolute horizontal intensity were made at eight stations, being those at which astronomical observations were made in determining the boundary between the United States and Mexico, under the treaty of 1853. The magnetic observations were intrusted to Mr. Marine T. W. Chandler, who succeeded in obtaining very complete determinations, as the subjoined abstracts show.

The *declination* was obtained by referring the direction of the needle to the astronomical meridian carefully determined for the survey of the line. The needle of a goniometer (by Young) was found to show a fair mean of five good needles of different lengths, and was therefore relied on at subsequent stations. The results are given in the general table below.

Observations of *inclination* were made with a ten-inch dip-circle (by Gambey) of superior construction. Two needles were used at each of the stations; and at three of them, viz: Carrizalillo, Espia, and Los Nogales, the poles were repeatedly reversed, so as to obtain the corrections to be applied when no reversal of poles was made. These corrections are + 12′ for needle No. 1, and — 15′ for No. 2, in the position of the poles called direct, and have been so applied in the following abstract of results:

Station.	Needle No. 1.		Needle No. 2.		Remarks.
	Dip.	No. of sets.	Dip.	No. of sets.	
	° ′		° ′		
Initial Point	58 30	3	58 19	3	
Carrizalillo	58 31	3	58 13	3	Poles reversed in each set.
Espia	57 59	1	57 50	2	" " " "
Ojo del Perro	57 28	2	57 5	2	
San Luis Springs	57 37	1	57 21	1	
San Bernardino	57 19	4	56 58	4	
Santa Cruz river	57 28	2	57 17	2	
Los Nogales	57 13	1	57 1	1	Poles reversed in each set.

The difference of about 16′ between the results by the two needles is too large to admit of the mean being taken. An examination of the pivots having shown some corrosion on a pivot of No. 2, the probability is that the results by No. 1 are to be preferred, especially as the observations with that needle show a greater consistency among themselves. The results by No. 1 are therefore adopted in the general table.

Observations for horizontal intensity were made with a unifilar magnetometer by Jones. The deflections were measured on a nine-inch circle, according to Lamont's method, in which the two magnets remain at right angles. In the vibration experiments, the time of 400 vibrations is usually observed, of which six values are obtained in each set, in the usual way. Experiments to determine the moment of inertia of the magnet and its attachments were made repeatedly by vibrating it loaded with a brass ring, marked No. 11, of which the outside diameter is 2.899 inches, the inside diameter 2.462 inches, and the weight 719.90 grains; hence its moment of inertia, K, $= 9.04$, expressed in feet and grains. The magnet used, marked X 7, is of the usual form, being a hollow cylinder of 0.3 inch in diameter, and 3.66 inches in length, and carrying a mirror. Its temperature coefficient was determined at Washington city, in February, 1856, by vibrations at temperature near 30° and 70°, and was ascertained

$$q = 0.0003.$$

The following is an abstract of the observations; to which is to be added, that, in the experiments without the inertia ring, the effect of 90° of torsion was 7′.5; in those with the ring, 15′.

Abstract of observations for horizontal intensity.

Station.	VIBRATIONS. Without ring. T Time of 1 vibr.	Temperature.	With ring. T_r Time of 1 vibr.	Temperature.	DEFLECTIONS. $r = 1.3$ feet. u	Temperature.	Date.
	s.	°	s.	°	° ′	°	
Initial Point	3.795	74.5	7.946	69.5	2 29.6	61	1855.
	3.795	59	7.935	63	28.7	53.5	
					30.0	41	
Mean	3.795	67	7.941	66	2 29.4	52	January 4.
Carrizalillo	3.817	76			2 31.2	59	
	3.823	71.5	7.983	76	2 31	67.5	
	3.826	83			2 29.9	64.5	
Mean	3.822	75	7.983	76	2 30.7	64	March 1.
Sepia	3.770	63	7.910	70			March 28.
Ojo del Perro	3.791	63					April 3.
San Luis Springs	3.751	61			2 30.0	64.5	
	3.757	73			2 30.0	66.5	
					2 27.0	65	
Mean	3.754	67			2 29.0	65	April 19.
San Bernardino	3.776	78.5					
	3.778	89.5					
	3.764	81.					
Mean	3.773	81					April 26.
Santa Cruz River	3.798	79					
	3.804	74					
Mean	3.801	73					May 14.
Los Nogales	3.805	94	7.949	80	2 26.5	81.5	
					25.2	83	
Mean					2 25.85	82	June 15.

From the preceding data we first deduce the moment of inertia, K, of the magnet and its attachments, by the equation $K = K_r \frac{T^2}{T_r^2 - T^2}$, where T_r and T are the terms of one vibration with and without the inertia ring, corrected for torsion, and reduced to the temperature of experiments without the ring, and obtain the following values:

At Initial Point,	$K = 2.669$
Carrizalillo,	2.680
Espia,	2.659
Los Nogales,	2.668
Mean,	2.669

From the experiments of deflection we next deduce the values of ratio of m, the magnetic moment of the magnet, to X, the horizontal component of the earth's form, by the expression $\frac{m}{X} = \frac{1}{2} r^3 \sin u$, and obtain at

Initial Point,	$\frac{m}{X} = 0.0477$,	temp. 52°
Carrizalillo,	0.0481,	" 64°
San Luis,	0.0476,	" 65°
Los Nogales,	0.0466,	" 82°

Computing for the same stations the product $m X = \frac{\pi^2 K}{T^2}$, where T is corrected for torsion, and reduced to the temperature of the corresponding deflections, and eliminating X, we get the following values of m.

Station.	Date.	m	Temperature.	m reduced to 66°.
			°	
Initial Point	January 4	0.2959	52	0.2947
Carrizalillo	March 1	0.2951	64	0.2949
San Luis	April 19	0.2962	65	0.2961
Los Nogales	June 16	0.2915	82	0.2929

Although the difference in these values of m may be in a great measure due to errors of observations, rather than to fluctuations in the magnetism of the magnet, still the best results appear to be obtained by using the above values of m for the respective stations, and assuming a uniform rate of change during the intervals.

Computing, lastly, $m X$ for each of the stations, and dividing by m determined in the manner indicated and reduced to the temperature of the vibrations, we obtain the values of X given in the subjoined table, which exhibits collectively the results obtained.

General table of results.

Station.	Latitude.	Longitude.	Declination east.	Dip.	Horizontal intensity.	Total intensity.
	° ′	° ′	° ′	° ′		
Initial Point	31 47	106 28	11 55	58 39	6.202	11.92
Carrizalillo	31 51	107 56	12 2	58 31	6.125	11.73
Espia	31 21	107 56	12 5	57 59	6 249	11.77
Ojo del Perro	31 21	108 20	11 58	57 28	6.156	11.45
San Luis Springs	31 20	108 48	11 45	57 37	6.265	11.70
San Bernardino	31 20	109 14	11 45	57 19	6.252	11.58
Santa Cruz River	31 18	110 31	12 13	57 28	6.169	11.47
Los Nogales	31 21	110 51	11 45	57 13	6.262	11.56

II. *Discussion of lines of equal magnetic declination, dip, and horizontal intensity.*

In this discussion, the observations made in previous years in connexion with the Mexican boundary surveys, and published in the fifth volume, new series, of the Memoirs of the Academy, have been combined with those communicated in the present paper. Observations made under the direction of Professor A. D. Bache, Superintendent of the Coast Survey, at stations Dollar Point, East Base, and Jupiter, near Galveston, Texas, and near San Diego, Monterey, and San Francisco, and affording important co-ordinates for the curvature of the lines, have also been introduced; likewise, an observation of the declination at the Great Salt Lake, by Captain Howard Stansbury, U. S. Topographical Engineers, published in his report of the survey of that region.

The method employed in determining the lines of equal declination and dip was partly graphical and partly analytical, being the same pursued by Professor Bache and Mr. J. E. Hilgard in their discussion of the Coast Survey magnetic observations.—(Coast Survey Report for 1855, Appendix, p. 47.) The stations were projected on a map, and their positions referred to a right line graphically assumed as axis of co-ordinates, the origin being chosen about the mean position of the stations, and the direction so as nearly to divide the positive and negative ordinates equally.

The co-ordinates being read off on any convenient linear scale, conditional equations are formed for each station or group of stations, and the whole scheme is solved by the method of least squares. The conditional equations representing an interpolation by second differences are of the form,

$$V = V_0 + v + xX + yY + zXY + pX^2 + qy^2,$$

when V is the observed declination (or dip);

V_0, the assumed declination at the origin; v, the correction to be applied;

X and Y, co-ordinates of position.

x, y, z, p, q, coefficients to be determined.

The solution of a considerable number of such equations involves a great deal of labor, which the results amply repay, however. The process being well known, there is no occasion to give the steps of the calculations in this place. After determining the coefficients, the co-ordinates of points in the lines sought were computed, the lines projected on the map, and the latitudes and longitudes of points read off and tabulated.

In the absence of any data to determine the secular changes, the results are doubtless liable to an uncertainty from that source. We know, however, that the changes are small, and, for the limited period over which the observations extend, they may be considered as merged in the local errors, and the average date of 1852 as belonging to the resulting lines on the map.

The following tables give a general *résumé* of the observations, and the corresponding values in the computed system; also the residuals, the distribution of which is the best evidence of the successful representation of the general facts involved.

The geographical position of points in the lines of equal declination and dip—isogonic and isoclinal lines—are also given in tables from which they may be readily projected in any map.

Observations of Declinations.

No.	Station.	Latitude.	Longitude.	Date.	Declination east, observed.	Declination east, computed.	Residual, computed — obs.
		° ′	° ′		° ′	° ′	′
1	Dollar Point	29 26	94 53	1848	8 57	9 03	+ 06
2	East Base	29 13	94 55	1853	9 05	9 02	− 03
3	Jupiter	28 55	95 20	1853	9 09	9 10	+ 01
4	Rio Grande, mouth	25 57	97 07	1853	9 00	8 56	− 04
5	Ringgold Barracks	26 23	98 43	1853	9 15	9 18	+ 03
6	Fort McIntosh	27 30	100 05	1852	10 00	9 46	− 04
7	Eagle Pass	28 42	100 30	1852	10 01	10 07	+ 06
8	Presidio del Norte	29 34	104 25	1852	10 16	10 53	+ 37
9	Mouth of Cañon	31 02	105 37	1852	12 01	11 28	− 33
10	Emory's Initial Point	31 47	106 28	1855	11 55	11 48	− 07
11	Frontera	31 49	106 29	1852	12 04	11 49	+ 25
12	Doña Ana	32 22	106 45	1851	12 07	12 02	− 05
13	Carrizalillo	31 51	107 58	1855	12 02	11 58	− 04
14	Espia	31 21	107 56	1855	12 05	11 48	− 17
15	Copper Mines	32 48	108 04	1851	11 22	12 18	+ 56
16	Ojo del Perro	31 21	108 20	1855	11 50	11 50	− 00
17	San Luis Springs	31 20	108 48	1855	11 45	11 52	+ 07
18	San Bernardino	31 20	109 14	1855	11 45	11 53	+ 08
19	Santa Cruz River	31 18	110 31	1855	11 45	11 58	+ 13
20	Los Nogales	31 21	110 51	1855	12 13	12 00	− 13
21	San Pedro	32 59	110 40	1851	12 25	12 37	+ 12
22	Pimos Villages	33 07	111 44	1851	12 52	12 46	− 06
23	Gila Junction	32 43	114 53	1851	12 50	12 45	− 05
24	San Isabel	33 09	116 28	1852	12 34	12 55	+ 21
25	Camp Riley	32 36	117 05	1849	12 57	12 44	− 13
26	San Diego	32 42	117 12	1849	13 15	12 47	− 28
27	San Diego C. S.	32 41	117 13	1851	12 29	12 48	+ 19
28	Monterey	36 36	121 54	1851	14 58	14 54	− 04
29	San Francisco	37 48	122 27	1852	15 30	15 34	+ 04
30	Salt Lake City	40 46	112 08	1850	15 34	15 34	00

Isogonic Lines.

GEOGRAPHICAL POSITIONS OF POINTS.

Longit'de.	9°	10°	11°	12°	13°	14°	15°	Declination east.
°	° ′	° ′	° ′	°	° ′	° ′	° ′	
95	28 50							
96	27 28							
97	26 23							
98	25 34	30 17						
99	24 57	29 18						
100		28 32						
101		27 54						
102		27 27	31 19					
103		27 4	30 35					
104			30 7					
105			29 45	33 8				
106			29 27	32 36				
107			29 14	32 13				
108			29 4	31 54	34 54			
109				31 39	34 29			
110				31 28	34 9			Latitude.
111				31 20	33 54			
112				31 14	33 43			
113				31 10	33 33	36 9		
114					33 24	35 47		
115					33 17	35 35	38 3	
116					33 14	35 25	37 46	
117					33 12	35 17	37 31	
118						35 10	37 19	
119						35 5	37 9	
120						35 2	37 1	
121						35 0	36 54	
122						34 58	36 48	
123							36 44	
124							36 41	

Observations of Dip.

No.	Station.	Latitude.	Longitude.	Date.	Dip observed.	Dip computed.	Residual, comp. obs.
		° ′	° ′		° ′	° ′	′
1	Dollar Point	29 26	94 53	1848	57 56	58 06	+ 2
2	East Base	29 13	94 55	1853	57 49	57 45	+ 3
3	Jupiter	28 55	95 20	1853	57 19	57 07	− 5
4	Rio Grande, mouth	25 57	97 07	1853	59 23	59 14	− 9
5	Ringgold Barracks	26 23	98 43	1853	59 27	59 35	+ 8
6	Fort McIntosh	27 30	100 05	1852	54 07	53 58	− 9
7	Fort Duncan	28 42	100 30	1852	55 31	55 35	+ 4
8	Presidio del Norte	29 34	104 25	1852	55 41	55 59	+ 18
9	Mouth of Cañon	31 02	105 37	1852	57 36	57 43	+ 7
10	San Elecario	31 35	106 16	1852	58 57	58 17	− 30
11	Frontera	31 48	106 32	1852	59 05	58 32	− 33
12	Doña Ana	32 22	106 47	1851	59 06	59 08	+ 2
13	IX	32 22	107 24	1851	59 09	59 00	− 9
14	Copper Mines	32 47	108 04	1851	59 17	59 23	+ 6
15	Emory's Initial Point	31 47	108 28	1855	58 39	58 30	− 9
16	Carrizalillo	31 51	107 56	1855	58 31	58 23	− 8
17	Espia	31 21	107 56	1855	57 39	57 41	− 18
18	Ojo del Perro	31 21	108 20	1855	57 28	57 40	+ 12
19	San Luis	31 20	108 48	1855	57 37	57 36	− 1
20	San Bernardino	31 20	109 14	1855	57 19	57 30	+ 11
21	Santa Cruz River	31 18	110 31	1855	57 28	57 21	− 7
22	Los Nogales	31 21	110 51	1855	57 13	57 21	+ 8
23	Ojo de Inez, or Gavilan	32 45	108 14	1851	59 18	59 22	+ 5
24	Station 1 (along the Gila)	32 50	109 34	1851	59 19	59 12	− 7
25	2	32 50	109 37	1851	59 12	59 12	0
26	3	32 53	109 44	1851	59 12	59 15	+ 3
27	4	32 57	109 49	1851	59 20	59 18	− 2
28	5	33 04	109 55	1851	59 27	59 25	− 2
29	6	33 06	110 00	1851	59 38	59 30	− 8
30	7	33 10	110 03	1851	59 42	59 33	− 9
31	8	33 12	110 10	1851	59 37	59 35	− 2
32	9	33 13	110 19	1851	59 45	59 35	− 10
33	10	33 12	110 19	1851	59 34	59 30	− 4
34	12	33 09	110 26	1851	59 37	59 28	− 9
35	13	33 09	110 28	1851	58 58	59 26	+ 28
36	15	33 09	110 31	1851	59 28	59 25	− 3
37	17	33 12	110 42	1851	59 23	59 28	+ 5
38	19	33 05	110 35	1851	59 5	59 19	+ 14
39	20	32 50	110 40	1851	59 11	59 13	+ 2
40	21	33 03	110 46	1851	58 59	59 16	+ 17
41	22	33 05	110 50	1851	59 13	59 18	+ 5
42	23	33 07	110 55	1851	59 23	59 20	− 3
43	24	33 06	111 02	1851	59 20	59 18	− 2
44	26	33 04	111 11	1851	59 25	59 14	− 11
45	27	33 03	111 16	1851	59 20	59 12	− 8
46	28	33 01	111 23	1851	59 16	59 10	− 6
47	29	33 04	111 34	1851	59 06	59 10	+ 4
48	30	33 08	111 44	1851	59 06	59 14	+ 8
49	31	33 10	111 54	1851	59 28	59 16	− 12
50	32	33 09	111 57	1851	59 22	59 16	− 6
51	38	33 00	112 39	1851	58 53	58 57	+ 4
52	39	32 59	112 43	1851	58 49	58 56	+ 7
53	40	33 02	112 55	1851	59 16	58 59	− 17
54	42	32 58	113 11	1851	59 17	58 52	− 25
55	43	32 49	113 33	1851	58 43	58 39	− 4
56	44	32 44	113 50	1851	58 30	58 30	0
57	45	32 41	114 05	1851	58 25	58 26	+ 1
58	Gila Junction	32 43	114 33	1851	58 30	58 28	− 2
59	New River	32 49	115 25	1849	58 19	58 20	+ 1
60	Santa Isabella	33 08	116 41	1849	58 48	58 44	− 4
61	Santa Maria	33 02	116 51	1849	58 42	58 37	− 5
62	San Diego	32 42	117. 08	1849	57 33	58 14	+ 41
63	San Diego C. S	32 41	117	1851	57 38	58 12	+ 34
64	San Francisco	37 46	122	1852	62 32	62 40	+ 8
65	Sacramento	38 34	121 17	1852	64 03	63 37	− 26

Isoclinal Lines.

GEOGRAPHICAL POSITIONS OF POINTS.

Long.	52°	53°	54°	55°	56°	57°	58°	59°	60°	61°	62°	63°	Dip.
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	
95	25 30	26 09	26 48	27 27	28 07	28 47	29 26	.....	.....	.....	.....	.....	
96	25 38	26 18	26 57	27 37	28 17	28 57	29 37	.....	.....	.....	.....	.....	
97	25 46	26 26	27 06	27 47	28 27	29 08	29 49	.....	.....	.....	.....	.....	
98	25 34	26 35	27 15	27 56	28 37	29 18	30 00	.....	.....	.....	.....	.....	
99	26 02	26 43	27 24	28 05	28 47	29 28	30 11	.....	.....	.....	.....	.....	
100	26 09	26 51	27 33	28 14	28 56	29 38	30 21	.....	.....	.....	.....	.....	
101	.....	26 59	27 41	28 22	29 05	29 48	30 29	.....	.....	.....	.....	.....	
102	.....	.....	27 49	28 31	29 14	29 57	30 42	.....	.....	.....	.....	.....	
103	.....	.....	.....	28 40	29 23	30 06	30 52	.....	.....	.....	.....	.....	
104	.....	.....	.....	.....	29 32	30 16	31 02	.....	.....	.....	.....	.....	
105	.....	.....	.....	.....	29 40	30 24	31 11	31 59	32 49	.....	.....	.....	
106	.....	.....	.....	.....	29 47	30 32	31 20	32 09	32 58	.....	.....	.....	
107	.....	.....	.....	.....	29 54	30 39	31 28	32 18	33 07	.....	.....	.....	
108	.....	.....	.....	.....	30 00	30 46	31 36	32 27	33 16	.....	.....	.....	Latitude
109	.....	.....	.....	.....	29 05	30 53	31 43	32 35	33 25	.....	.....	.....	
110	.....	.....	.....	.....	30 10	30 59	31 50	32 43	33 33	.....	.....	.....	
111	.....	.....	.....	.....	.....	31 05	31 57	32 50	33 49	.....	.....	.....	
112	.....	.....	.....	.....	.....	31 11	32 04	32 57	33 49	.....	.....	.....	
113	.....	.....	.....	.....	.....	31 17	32 11	33 04	33 57	.....	.....	.....	
114	.....	.....	.....	.....	.....	31 22	32 16	33 10	34 04	.....	.....	.....	
115	.....	.....	.....	.....	.....	31 26	32 21	33 16	34 11	35 07	.....	.....	
116	.....	.....	.....	.....	.....	31 31	32 26	33 22	34 18	35 15	.....	.....	
117	.....	.....	.....	.....	.....	31 35	32 31	33 28	34 24	35 22	36 19	.....	
118	.....	.....	.....	.....	.....	31 39	32 36	33 33	34 30	35 29	36 27	.....	
119	.....	.....	.....	.....	.....	.....	.....	.....	.....	35 36	36 35	37 35	
120	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36 42	37 45	
121	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36 49	37 54	
122	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38 02	
123	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38 11	

Horizontal intensity.—Combining the eight stations of 1855 among themselves, we obtain as a mean result, in latitude 31° 27′, longitude 108° 45′, $X = 6.21$, with a probable error of ± 0.01; also an increase of $+ 0.10$ in going south 30′.7 or east 506′, and the direction of the line of equal horizontal intensity N. 87½° E.

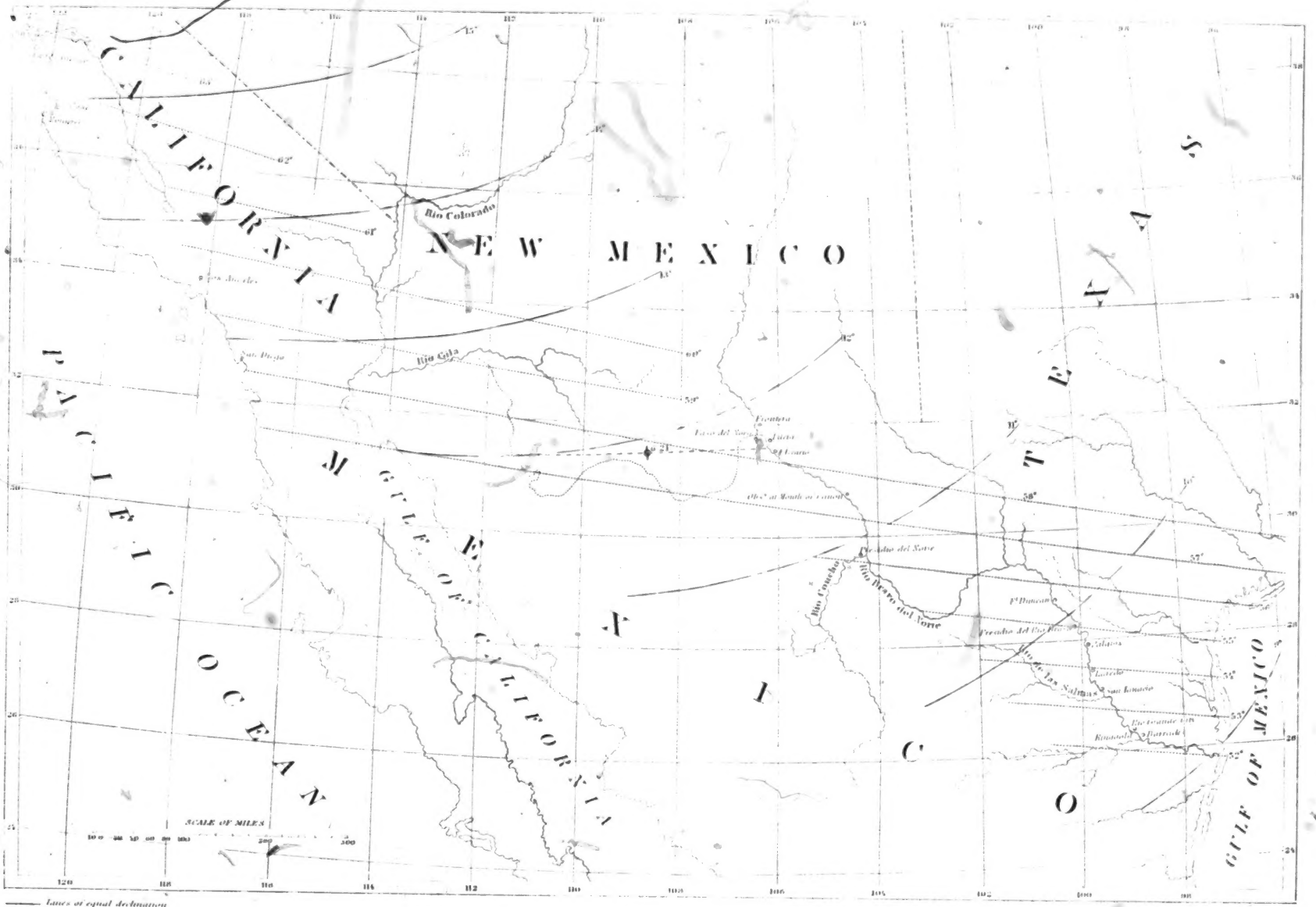
It may be observed, that this rate of change in going south is evidently too large, for according to the decrease of dip it would require a southing of 42′ to cause an increase of the horizontal force of $+ 0.10$, if the total force was constant; but as the latter also decreases in going south, the actual rate of change of horizontal force is probably only half of that above obtained. Moreover, when we consider that the same value of X is found on the coast of Mississippi, between New Orleans and Mobile, we see that the small increase in going east should be decrease of similar amount, and that the direction of the line should be about N. 94° E. The distribution of stations is such that these discrepancies in the rate of change are quite within the probable errors of observation and station errors; nor is the value of the mean result affected thereby, which forms a valuable datum in absolute measure, in an almost inaccessible region of the globe.

In order to compare this measure of force with that previously obtained on the northern line by observations with a Fox apparatus, and expressed in the arbitrary scale, we may have recourse to the observations of Captain Lefroy at Toronto, which gives the total force in British

units = 13.86 at the time that it is found 1.836 in the arbitrary scale. Applying the same ratio to our mean total intensity, 11.65, we find 1.543, and we have the following comparison:

Latitude.	Longitude.	Total intensity.
° ′	° ′	
31 27	108 45	1.543
32 43	108 30	1.580

the latter from three stations in 1851; exhibiting a closer correspondence than might be expected from the circuitous comparison involved.



United States & Mexican Boundary Survey.

PART II.

GEOLOGICAL REPORTS

DOCTOR C. C. PARRY AND ASSISTANT ARTHUR SCHOTT.

NOTES BY W. H. EMORY.

PALÆONTOLOGY AND GEOLOGY OF THE BOUNDARY.

PARTS HALL OF LIBRARY, NEW YORK.

DESCRIPTION OF ANNULOSES AND TERTIARY FOSSILS.

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OF

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DESCRIPTION OF CRETACEOUS AND TERTIARY FOSSILS,

BY

T. A. CONRAD, ESQ.

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GEOLOGY AND PALÆONTOLOGY.

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NOTE.—I think it proper to state that I do not concur with Mr. Schott in his conclusion on page 94, where he says: "From this we have the proof of a former immediate connexion in these latitudes between the two oceans of our globe." In the original proof this conclusion was erased, but by some accident was afterwards inserted. W. H. E.

ERRATA.

On page 91, line 41, for "nearly" read near.

CHAPTER I.

GENERAL GEOLOGICAL FEATURES OF THE COUNTRY.

WASHINGTON, D. C., *April* 1, 1854.

Colonel W. H. EMORY, *United States Commissioner:*

SIR: In completion of the duties assigned me as botanist and geologist to the United States boundary commission, I present the following:

I. GENERAL PHYSICAL AND GEOLOGICAL FEATURES OF THE COUNTRY.

The general features of the Mexican Gulf Coast, in connexion with the United States and Mexican boundary line, present a marked contrast with those observed on the opposite Pacific coast. Thus, instead of the high cliffs, abrupt headlands, and general bold and rugged outline exhibited on the Californian coast, the Texan shore-line, throughout its whole extent, presents a uniform, low dead level. Generally, indeed, the main coast is shut in from the open sea by ranges of sand islands formed by the waves of silted sea sand and comminuted shells. Inside of this line of islands shallow bays spread themselves into the indented coast, and here the numerous rivers flowing from the interior meet the tide-water. The tide range is moreover small, and thus the alternating differences of level do not favor the formation of navigable estuaries by which the main land may be approached. These features, collectively, give to this coast an inaccessible character, and serve to render its navigation both difficult and dangerous.

Its rivers are unapproachable, except by vessels of very light draught; while the inlets to its shallow bays, obstructed by variable sand-bars, present obstacles to navigation, sufficiently proved by the numerous wrecks that strew their beach. Proceeding inland from the line of sandy beach, a gentle slope spreads out in a uniform gradually rising plane, composed of dark rich loam, and covered with luxuriant pasturage. The scenery is rarely relieved of its blank outline by a clump of *live oak* trees surrounding a sunken morass. Farther on, at a variable distance of 10 to 20 miles, the surface of the ground shows gentle swells, still maintaining its fertile character, and displaying here and there groves of *post oak* and other timber. The river bottoms adjoining are occupied with a heavy timber growth, principally of *elm*, (*ulmus crassifolia*,) festooned with *Spanish moss*. The undergrowth comprises a complete maze of shrubbery, matted and tangled together by vines and creepers, and supporting a rank annual growth.

At a distance of 50 to 80 miles from the coast, the ground-swells become more abrupt and form distinct ridges, between which are collected the drainage of the country. Along the course of the numerous streams there is an exposure of the geological substratum, consisting first of loose gravelly strata, which contain erratic pebbles of siliceous or calcareous character; to this

succeed occasional exposures of a coarse-grained sandstone, No. 1. Still farther inland we meet with a form of soft calcareous earthy rock outcropping along the sides of hills, and constituting the first outlayer of that extensive cretaceous formation which characterizes so large a scope of country throughout middle and northwestern Texas.

From San Antonio, occupying the first step in the cretaceous series, at an elevation of 600 feet above the Gulf of Mexico, proceeding northerly on the line of the lower road to El Paso, we soon remark a rapid change in the general features of the country. The underlying limestone formation becomes more largely developed, and is less deeply covered with alluvial deposits. The rock stratum is frequently exposed in the beds of streams, which are everywhere thickly strewn with the water-worn pebbles of this formation. The streams here acquire an intermittent character, subject to sudden overflow and recession. Their course, when low, is marked by an irregular series of deep basin ponds connected together only by shallow brooks, or even not at all above ground during dry seasons.

As we proceed, mural exposures of limestone rock become more frequent, and the same formation is met with on summits of the higher table-land. The alluvial tracts along the course of the larger valleys acquire a more arid character of soil, and support a stunted timber growth, in which mezquite makes its appearance. Fossil, fresh water, and land shells are quite abundantly scattered over the lower depressions of these alluvial bottoms.

At the crossing of the Rio Frio, near Fort Inge, occurs the first exposure of igneous rock. It is seen as an isolated knoll of dark-colored trap, showing at this place but slight disturbance of the adjacent cretaceous strata. This formation is thence observed to constitute a broken line, extending in a northwest course, and coming into view at several points along the road at variable distances of 5 to 10 miles.

On approaching the line of the great table-land formation of Northwest Texas, we find near its base the sources of most of the minor streams of this region. These sources frequently exhibit magnificent basin springs, of which that at San Felipe is a noted example.

We have here reached the main development of this extensive cretaceous formation, partially concealed from view towards the coast, as above noticed, by alluvial deposits, but here standing out in bold relief, variously exposed in extensive ridges, bounding, more or less closely, valleys

Character of valley denudations in the cretaceous table-land formation. Upper portion of San Pedro river, Texas.

of denudation, or else stretching in vast upland plateaus, thinly covered with soil, and supporting a close even growth of upland grasses or scanty shrubs.

The true character of this formation may be satisfactorily studied in the course of its principal streams, the Pecos and Devil's river. As exposed along the course of these valleys, the view is bounded by steep mural cliffs, composed of limestone, disposed in nearly horizontal strata. This rock exhibits quite a variable texture, its weathered face showing an uniform gray or bluish tint, while its recent fracture has a much lighter color. Owing to its irregular texture, it frequently exhibits a cavernous structure, displaying in its various exposures all the grotesque features of ruined castles, forts, and dilapidated masonry; examples of which may be seen by reference to numerous sketches.

The river valleys either expand into more or less extensive alluvial basins, or are completely hemmed in by steep mural faces, forming chasms along their course, to which the Spanish term of *cañon* is generally applied. Thus, in following out the course of valleys in this district, we have a series of basins connected by cañons; the relative extent of these distinct topographical features being dependent on the local character of the formation, or the varied influence of previous denuding forces.

The alluvial tracts partake to a great extent in the sterility of the plateaus with which they are connected, seldom showing evidence of fertility, and in a great measure destitute of timber growth.

In the case of the Pecos river, which may be regarded as the main type of streams belonging to this table-land formation, we observe a contracted but constant body of water coursing through alluvial tracts, or clearing its way through rocky cañons.

In the former case, its tortuous course is marked out between deep banks of earth, so that its turbid waters are for the most part invisible till you come directly on its brink. The average width of the stream, during most of the year, is about 50 feet, and 8 feet in depth. Only limited portions of the adjoining valley are subject to that degree of overflow, such as constitutes what is commonly understood as bottom-land. Owing to the steep and crumbling nature of the banks, travellers often experience no small difficulty in watering their animals; the water itself, though highly charged with reddish sediment, is not unpalatable.

In its passage through cañons, this stream, like the Rio Grande, cleaves its way between steep walls of rock; its course during low water being occasionally set off by lines of sandy or pebbly beach, and forming frequent rapids.

All the small intermittent streams of this region are copiously bedded with rounded pebbles, derived from the adjoining limestone formation.

The view from the summit elevations presents not an unbroken table-land, but rather a series of terraces, exhibiting occasionally truncated peaks, and showing a general increasing elevation westward. The mean level is, moreover, marked by depressed valleys, containing dry pebbly beds of streams, and frequently expanding into wide basins. The descent to these valleys is generally abrupt, and is the chief obstacle in the construction of roads, which, with this exception, are marked out with ease, and are unexcelled for purposes of wagon transportation.

The supply of water over these arid tracts, except in a season of rain, is confined to a few isolated springs, occupying the lower level of some of these depressed valleys, or occasionally bursting out from the base of high rocky ledges. These springs, though generally affording a copious and constant flow of water, are not sufficient to give origin to river tributaries, their issue being quickly absorbed in the lower course of their arid beds. In several of these springs

the temperature is as high as 70° Fahrenheit. Between these watering places occur what are termed by travellers "*dry stretches*," being in some instances 50 miles in extent.

In all our observations thus far, little disturbance is noticeable in the position of the strata. To ordinary view they appear strictly horizontal; the indications of the barometer and the changes of the climate prove, however, a gradually increasing elevation. The height, as indicated at the Leon spring, the most western point of the continuous table-land at which cretaceous fossils were collected, is 2,807 feet. This shows a rise of 1,800 feet from the lowest series of this formation, (the mouth of Devil's river,) and 2,200 feet above San Antonio, giving an average rise of 7 feet to the mile.

Quite constantly in the distance, to the south and west, rugged mountain ranges are visible, evidently of igneous character, and connected with extensive disturbance of adjacent cretaceous rocks. It is through these, as we shall hereafter see, that the Rio Grande forces its way, presenting a series of chasms and deep cleft cañons of a most stupendous character.

The first indication of a change in the general features of scenery, as sketched above, on the line of the usually travelled road to El Paso, is encountered in the range of the "Sierra Diavolo," or Limpia mountains. This range may be regarded as the southern continuation of the great dividing ridge between the Pecos and the upper Rio Grande, including the Sacramento mountains to the north, the Guadaloupe and Limpia mountains, with their continuation south, to form the Sierra Rica of Mexico; through the latter portion of this range the Rio Grande forces its way a short distance below and east of Presidio del Norte.

This range is characterized, at all the separate points observed, by the presence of igneous rocks, varying considerably in structure and lithological character, as noted by Professor Hall in rock specimens Nos. 12, 13, 14, 15.

The elevation attained by this range, on the line of the El Paso road, is from 5,000 to 7,000 feet above the sea. On entering this range from the east, we pass quite abruptly from the horizontal limestone strata to the igneous exposures.

The passage of this range is accomplished by a series of rather steep and rough ascents, following up the course of the Limpia valley. The main pass, known as the "*Wild Rose Pass*," exhibits gigantic walls of rock, towering up on either hand to the height of 1,000 feet or more above the valley below.

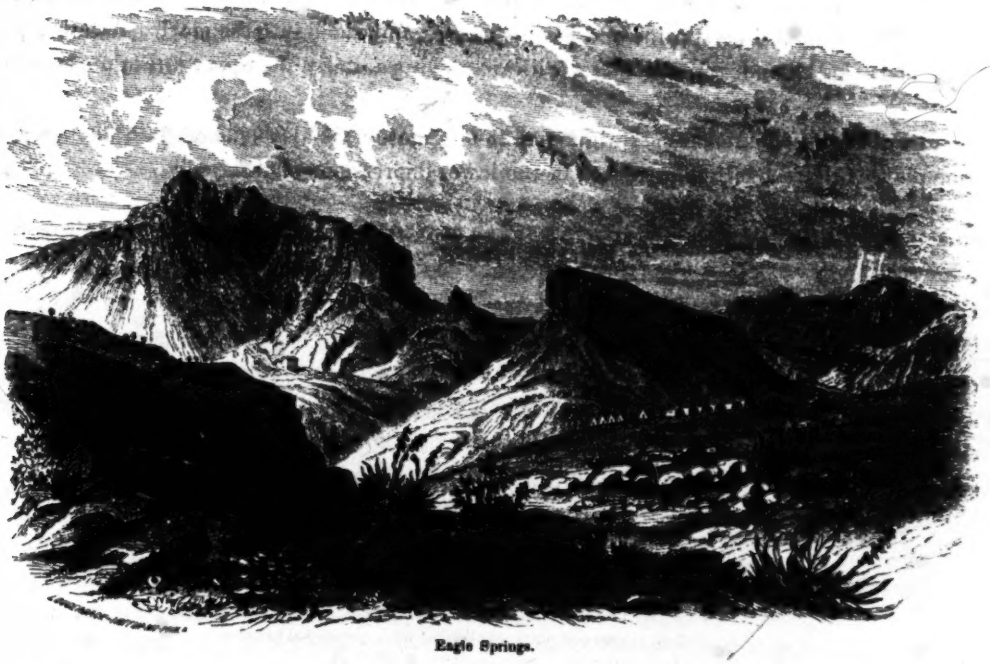
The summit divide is composed of a coarsely-grained granitic rock, formed principally of feldspar, and varying in color, in the different exposures, from dark brown to a dull whitish. In descending the more gradual western slope of this range, the rock exposures assume the character of a close porphyritic trap, of a reddish color. As we leave the main range, passing to the west, we encounter extensive ridges of stratified limestone rock, associated more or less closely with interrupted igneous exposures, and showing a general dip to the southwest, or away from the Limpia mountains. The inclination, however, shows, in many places, a variable direction and intensity, depending on local causes connected with adjoining igneous exposures.

A degree of metamorphism is also exhibited in rock exposures, having a gneissoid structure and traversed by quartz veins.

From the specimens collected, imperfectly characterized by fossils, Prof. Hall concludes that these stratified rocks belong to the carboniferous period.

Between these irregular mountain ranges and spurs, which in this section of country meet

the eye in every direction, the intervening surface spreads out into wide basin plains of an alluvial character. These basins receive and absorb the scanty streams of the adjoining mountains. Rarely indeed, except in the highest mountain recesses, is running water visible, the occasionally copious rains furnishing only a temporary current along the course of the numerous stream-beds. The water thus accumulated in rocky basins or marshy lagoons, affords the only supply for travellers, over these arid wastes. During the dry season these plains spread out their dreary tracts, unrelieved by a single feature of fertility, occupied by innutricious grasses or a scattered growth of dry shrubbery, among which the repulsive form of the "*Spanish bayonet*" (*Yuca*) is a conspicuous feature. Owing to their exposed and elevated position, these plains are subject to great extremes of temperature. They are mostly shut off from the Rio Grande by a variable mountain range, composed of the carboniferous limestone, variously associated with igneous rocks. The passage to the valley is accomplished by following down the natural cleft made by some rain stream. These passes exhibit fine sectional views of the tilted limestone strata, exposed in various conditions of disturbance, in some places inclined at an angle of 80° to the west, and at other points exhibiting evidences of igneous action in metamorphic changes.



Eagle Springs.

We have thus reached, on the line of the ordinary wagon-road, the upper valley of the Rio Grande, the external features of which, as more directly connected with the line of boundary, will claim a more detailed notice. At first, however, a more rapid sketch must suffice, while continuing to notice the general features of scenery and geological structure presented on the route westward to the lower valley of the Rio Gila.

As we pass from the rocky cañon, by which we enter on the Rio Grande valley, we first come upon a gravelly plain, generally presenting a smooth and more or less uniform surface, sloping

gently toward the main bed of the valley. This plain, in receiving the drainage from the adjoining mountain ranges, is variously cut up by deeply-trenched arroyos, and terminates on the alluvial tracts below in gravelly bluffs of variable height.

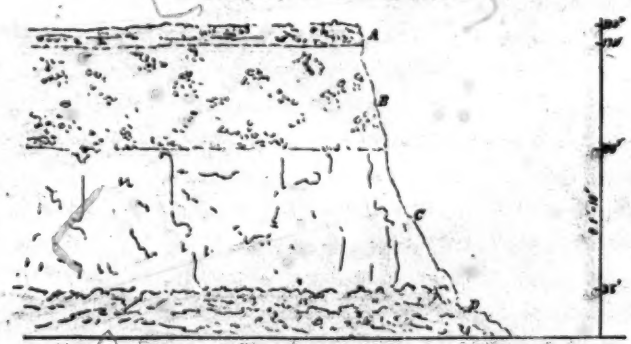
This table-land is encountered wherever the course of the Rio Grande is not hemmed in by precipitous rocky cliffs, and is seen forming a belt of variable width on both sides of the river, extending to the base of the adjoining mountains. In all these situations it presents very uniform features.

An obvious analogy will be at once perceived between the latter formation and the wide-spreading upland alluvial plains, before noticed; in fact, a direct continuous connexion between them may be often traced. They evidently belong to the same general formation, representing basins filled up with alluvial and diluvial depositions, concealing, it may be, older tertiary strata below.

The pebbles contained in this formation can readily be traced to their original sources in the adjoining mountains, being of larger size and more angular near the base of the mountains, and smaller and more rounded at a greater distance. The earthy medium is generally a coarse sand or fine marl, argillaceous matter being less frequent. Occasionally the exposed bluffs show deposits of gypsum, which in some localities forms extensive beds. The most usual form of this material is in confused crystalline and fibrous masses, imbedded in loose marl. At other places a calcareous chalklike deposition is met with, occupying usually the upper stratum of the table-land.

A general *saline* character, pertaining to this formation, is also evidenced in the growth of saline plants or direct salt efflorescence in the lower depressions of valleys.

SECTION OF EARTHY TABLE-LAND FORMING THE BLUFFS OF THE RIO BRAVO ABOVE EL PASO, CORRESPONDING WITH THAT FORMING THE "JORNADA DEL MUERTO," TO THE NORTH.



A. Highly calcareous marl, chalklike, with occasional pebbles.
B. Brownish gray sand, with nodules of clay.
C. Yellow ferruginous marl.
D. Debris of drifted sand and washed clay.

As seen from any high mountain elevation, this table-land sweeps with all the exactness of a sheet of water, encircling as with a shore-line the bases of distant mountains, frequently completely insulating peaks and ridges, and everywhere masking the true connexion of the various formations.

The progress of subsequent drainage is also plainly seen in the various terraced elevations

which this table-land assumes. It may further be observed, briefly, that this is the formation that stamps the character of sterility on so large a scope of country forming those desert tracts known as "*Jornadas*," of which the "*Jornada del Muerto*" is a noted example. It is to this character of country, moreover, properly belongs the Spanish term "*Llano Estacado*," or *Staked Plain*, a term which has been less appropriately applied by travellers to the cretaceous table-lands of Texas, before noticed.

The proper alluvial tracts of the Rio Grande, as here met with on our route, exhibit a belt of variable width, from a mere narrow strip to several miles in breadth. Its lower portions are marked by frequent sloughs and old river beds. The body of the soil is sandy, but acquires a somewhat compact texture from the deposition of river slime, and is further enriched by the decaying vegetation that luxuriates on its moist bottoms.

The desert table-land is constantly encroaching on this alluvial belt, in the washing of its numerous stream beds, or the finest sand wafted by the winds. The roads occupying the river bottom are usually heavy, and whenever practicable are gladly exchanged by the traveller for the compact table-land.

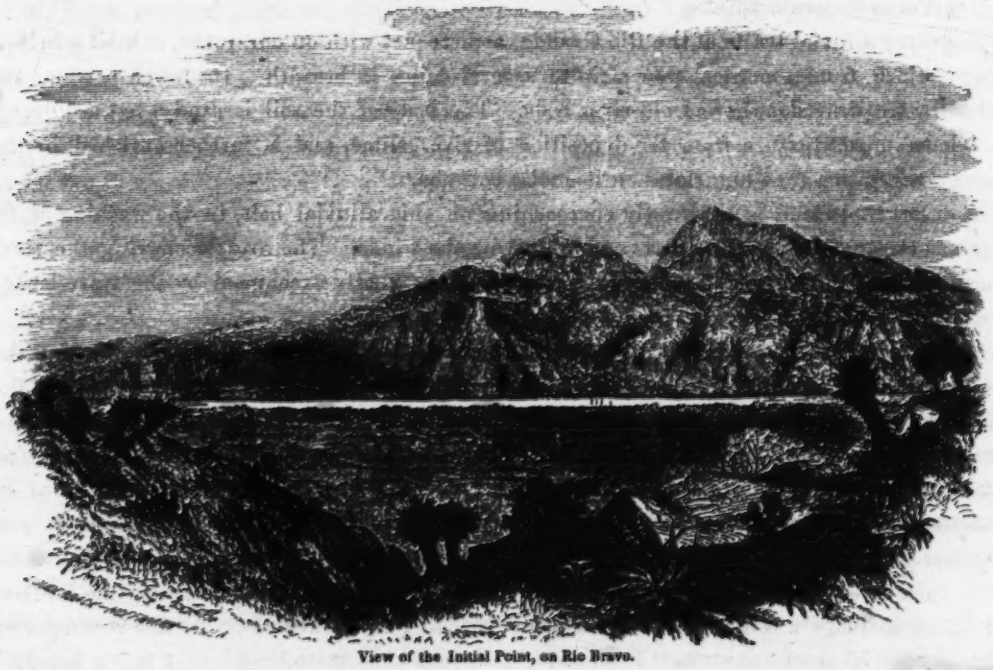
The river itself presents few features of attraction. Its turbid waters sweep along during the flood season, in June and July, a swollen tide, spreading its enriching sediment through the various sloughs and lagoons that line its course, often cutting off all approach by land to the main channel. During low water, which includes the greater part of the year, the river contracts its dimensions, running in a very variable channel, over sandy shoals, interrupted by numerous islands and exposed sand-bars. Occasionally, in very dry seasons, it ceases to run altogether, and stands in stagnant pools.

The portion of the river bottom at present under cultivation in connexion with the El Paso settlements includes a large basin lying south of the El Paso mountains. In this is comprised the large alluvial tract known as "*The Island*," which is 30 miles in length by 2 to 5 in breadth. This island lies on the American side of the main channel, being separated from the adjoining land by an old river bed, which, except in very low water, still carries a variable stream. The bifurcation of these two arms of the river at the head of the island is taken advantage of to direct a stream of irrigating water through the centre of this tract of land, extending nearly its whole length, and furnishing from its main trunk side branches to supply the cultivated fields. Thus in usual seasons a sufficient supply of water is obtained to meet the wants of ordinary cultivation. At times, however, low water in the main channel is a certain precursor of drought; while at other times an unwonted abundance exposes to the danger of floods.

On the main banks of the river, including the Mexican town of El Paso, and Franklin, on the American side, these inconveniences are measurably obviated by drawing the irrigating supply from a higher source. This is accomplished by the construction of an artificial dam, located some two miles above these respective towns, thus allowing the construction of water-gates and waste-weirs to regulate the supply of water according to need.

Hitherto we have observed the Rio Grande in its character of a variable stream, bordered by alluvial bottoms frequently of considerable width and extent; these again everywhere limited by gravelly table-land, sloping upward to the bases of distant mountains. A short distance above El Paso a new feature presents itself, and we have the mountains themselves encroaching directly on the bed of the river, which here passes in a contracted channel between rocky walls.

The rock exposures on the river bank exhibit disturbed strata of limestone, characterized by frequent fossils as belonging to the *Cretaceous* period. A greater or less metamorphism of this or a more ancient sedimentary rock is also exhibited, while on either side of the river tower up to a height of 500 to 1,000 feet rugged igneous rocks, having a granitic texture, and characterized by Professor Hall as "feldspathic or granitic lava." (No. 40.)



View of the Initial Point, on Rio Bravo.

On the Mexican side, the various formations, stratified and igneous, are blended and intermixed in great confusion, the connexion between the various formations being obscured by the irregular exposure of igneous products, the greater or less degree of metamorphism of adjoining sedimentary rocks, and the presence of extensive diluvial deposits. The general surface is thus rendered extremely rugged and broken, the traversed roads being obliged to make a considerable detour from the course of the river.

On the American side is conspicuous a high mountain range, nearly parallel to the river, at a variable distance of from 3 to 10 miles, and observing a regular north and south course. This range is seen to be composed of stratified limestone, dipping very uniformly at an angle of 45° W.S.W., or toward the river; in the face of this dip rest the various igneous outbursts, associated with the disturbed cretaceous beds. This limestone is determined by Professor Hall to belong to the carboniferous series, being a northern continuation of that before noticed at Eagle Springs.

The remarkable character of the stratification is conspicuous at a great distance, its deep gullies presenting fine sectional views, and the different exposures of its sloping surface exhibiting variously curved lines, as the strata are thus brought to view by the action of the denuding forces.

The highest summit of this range presents a sharp, jagged crest, such as might readily be

mistaken at a distant side view for an igneous formation. Connected with this upper crest, we also notice outweathering masses of siliceous rock, (No. 38;) these frequently assume grotesque forms and positions, representing various tower-shaped prominences.

MOUNTAINS EAST OF RIO BRAVO SEEN FROM EL PASO.

A. Cretaceous rocks resting on granite, and diping at an angle of 10–15°.
B. Granite.
C. Carboniferous limestone.
D. Porphyry peak.
E. Drift.

At another point this mountain range is interrupted in its usual stratified character by the presence of a porphyritic exposure, (specimen rock No. 41,) forming a dyke, passing through the entire ridge from east to west, and constituting the highest point in this range.

This igneous mass is variously associated with the adjoining limestone strata, lying either above or below, without showing any local variation of the ordinary dip, or exhibiting metamorphic changes at the point of junction.

On its eastern aspect, this range exhibits a precipitous slope, revealing the thickness of the formation in the regular succession of the uplifted strata, as thus exposed, from summit to base; there is developed at several points a thickness of not less than 1,500 feet. No very marked change is observable in the character of the rock from above downwards, or any local evidence of a change of formation.

We have, however, evidence from erratic fossils of the presence of a lower order of rocks, belonging to the *Silurian* period, in this vicinity. Such a formation has been assigned to a corresponding location west of El Paso, by Wislizenus, and there is little doubt but a careful examination along the lower line of these uplifted strata would bring to light this lower class of rocks.

This range continues to the north, forming the Organ mountains, at which point these stratified rocks give place to various forms of igneous products, as indicated in rock specimens Nos. 42 to 46, inclusive.

About seven miles north of El Paso, the mountains adjoining the river give place to the more usual character of gravelly table-land and alluvial bottoms, as noticed below. The table-land is here seen swelling to its broadest dimensions, encircling the distant mountains in every direction, and stretches northward to form the dreaded *"Jornada del Muerto;"* thence sweeping round the northern point of the Organ mountains, it constitutes the extensive desert tract between the Rio Grande and the Sacramento mountains. To the west the same formation is seen, variously interrupted by mountain ranges and isolated points of igneous rock, extending to the base of the Sierra Madre.

In further continuation of our general sketch of external and geological features of country,

we now take up the line of march westward, leaving the valley of the Rio Grande at El Paso, to follow out the most southern line of emigrant travel to the lower valley of the Gila river.

On leaving the alluvial basin, in which El Paso is situated, we first ascend over a lower step in the gravelly table-land, sloping gradually upwards, and presenting all the characters of scenery before described. We pass mountain spurs on the right and left, composed of the limestone rock, similar in appearance to the range noticed on the American side of the river, and having the same general dip to the southwest, but at a smaller angle.

Our route, following at first the regular Chihuahua road, passes nearly due south; in about 15 miles from the river we reach a second terraced elevation of the table-land, rising as a steep bluff 80 to 100 feet above the lower step over which we have been passing. The character of this higher deposit is here plainly exhibited in the face of the cliff, consisting of alternate layers of yellow ferruginous marl and coarse brown sand, capped with a thin layer of highly calcareous marl.

From the summit of this second elevation stretches a wide table plain, variously indented by shallow valleys, and swelling toward the base of the mountain ranges. On approaching the line of mountains lying to the southeast, we pass over a spur of limestone rock, connected with this range, showing a dip of 15° to the northeast, a similar inclination being apparent in the principal range. The rock formation appears to be identical with that before noticed near El Paso, having a directly opposite dip, thus forming a synclinal axis, in the trough of which our route seems to have been marked out. Leaving this latter range to some distance on our left, we approach a long serrated ridge of mountains lying directly in our course; near the base of the southeastern extremity of these mountains, occurs the first permanent water since leaving the Rio Grande, about 32 miles distance. This locality is the "Samalayuca Spring."

A short distance beyond this, commences the singular formation known as the "*Medanos*," or *Sand-hills*. They here rise conspicuously to view from the plain below, presenting an exact appearance of the sandy dunes along a stormy seacoast. It is difficult, at first sight, to disconnect this remarkable formation from such an obvious cause, and not to represent it as the sandy beach of the extensive lake in which the deposits were made, forming the wide expanse of table-land so often referred to. The present facts, however, do not warrant such an exclusive opinion; thus the separate grains of sand composing the sand-hills are seen under a lens to be angular, and not rounded, as would be the case in regular beach deposits; they are also extremely light and penetrating, of which every traveller who has occasion to pass this locality in a dry, windy day will have *ocular* demonstration. In fact, the peculiar features of this formation are sufficiently explained in the topographical arrangement of the country, which presents an immense plain, stretching out in the direction of the prevalent northwest winds.

In overlooking the surrounding country from the projecting point of the adjacent gneiss range, these sand-hills are seen to form a crescent, with its concavity toward the northwest, and rising highest where the accumulated deposit is most sheltered by rocky barriers, from the levelling influence of winds, other than those from the northwest.

The spring which occurs in this locality near the base of these sand-hills occupies a natural depression of the general plain. Its issue spreads in a shallow pool surrounded by aquatic plants and shrubbery. The central spring source forms a deep hole, about two feet in diameter, bedded with quicksand, which is surges up intermittently at various points. The temperature of the water is 70° Fahrenheit.

On entering the sand-hills from the north, we first pass over a considerable swell of limestone rock, from the southern slope of which we pass at once into the hills of sand. Its surface, at first variously scattered with arid shrubbery, becomes as we proceed almost pure drifting sand, blown by the wind into varying ripple-marks, and assuming all the different shapes of drift and hollow imaginable. As the view of the surrounding country becomes shut out, there is presented an exact picture of the sandy dunes on an exposed seacoast, and it seems almost strange not to hear the roaring of the surf, or catch a view from the highest elevations of a wide ocean expanse.

The greatest height of this formation is on the southern side, or in the convexity of the arch, which terminates with a somewhat abrupt face, merging into the shrubby plain below.

Our route from this point leaves the Chihuahua road, passing more to the west, and thence skirting along the base of jagged mountains, forming a broken range to the south and south-west. The plain traversed is similar in character, and continuous with that on the opposite side of the sand-hills, having, however, an increased elevation. Our route, bearing S.S.W., is interrupted by occasional spurs of limestone rock, proceeding from the adjoining mountains to the south.

This character continues for some twenty miles, when we begin to notice an obvious change in the external features of the country. The frequent valleys leading from the broken mountain range on our left acquire a more fertile character, and, being removed from the incursions of drifting sand, support a richer growth of plants. Beyond this, the country spreads into wide basin plains, presenting to the eye an uniformly smooth outline. The soil is composed of a stiff clay sediment, and is occupied exclusively with a growth of coarse grasses. In their lower depressions these extended plains frequently present a perfectly bare surface, destitute of all vegetation, the retentive soil either holding the product of recent rains in wide, shallow pools, or more often showing a surface cracked and blistered under the influence of an arid atmosphere. We find frequently scattered over its surface recent land shells, as indications of its lacustrine character. In certain localities these lower depressed flats are covered with a white saline efflorescence, resembling at a distance sheets of water, to the frequent disappointment of the thirsty traveller. The roads leading over these tracts are firm and excellent. The natural supplies of water are very inconstant, being in great measure dependent on rains.

Our road hence, for a long distance, traverses a succession of these plains, of greater or less extent, alternating with short ridges, occasioned by the passage of an irregular mountain range.

These ridges present along their line of elevation various depressions, at which the passage is generally accomplished by an easy gravelly slope. The exposed rocks are of carboniferous limestone, associated with various igneous products.

This character of country continues till we reach the first flowing stream yet encountered on our march from the Rio Grande; this is the *Rio Sta. Maria*. As here exhibited, it shows a flowing brook of limpid water, from 10 to 20 feet in width; at the crossing knee-deep, and flowing over a pebbly bed. Its source lies far to the south, in the State of Chihuahua; thence flowing north, it empties, about 30 miles from our place of crossing, into Lake Sta. Maria. This lake is shown, by the examination of the boundary commission, to be in close proximity to the larger Lake Guzman, from which it is separated by a range of mountains.

These lakes, though thus separated, belong to the same general basin, receiving the drainage of a large tract of country—the San Miguel and its tributaries entering on the north, and the

Sta. Maria on the south. The waters of these lakes having no outlet, are strongly impregnated with saline substances, so as to be unfit for drinking.

The adjoining mountains on our route are of igneous character, being composed of vesicular and amygdaloid trap, forming more or less continuous ridges, ranging north and south.

Associated with the fact of running water in this region, we see the country characterized by an unwonted appearance of fertility and verdure, not alone confined to the immediate borders of the stream, but extending over the hills and plains adjoining.

Our route, after crossing the Sta. Maria river, takes a course S. 70° W., (mag.,) passing over country characterized as above, bounded by mountain ridges of less height above the general surface than those before passed. The greatest development of mountain range lies to the west. The various rock exposures exhibit most abundantly forms of amygdaloid trap; more rarely we meet with local exposures of limestone strata, or variable metamorphic products.

Conspicuously in view in our direct course are the mountains in which the silver mines of Corralitas are located, consisting of an assemblage of rounded and peaked summits of various heights, rising from 500 to 1,500 feet above the adjoining plain.

These mountains occupy an area of about 5 miles in length from north to south, and 2 to 3 miles in width. They rise isolated in the midst of a broad alluvial plain, sloping gradually on the east and west towards the respective valleys of the Sta. Maria and Corralitas rivers. A wide intervening depression also separates them from higher mountain ranges north and south. The latter mountains present a marked contrast in their precipitous sides and exposed rock of a basaltic character to the uniform smooth outline of the mineral-producing mountains. In these latter, indeed, the geological formation is everywhere concealed from view by a variable deposite of earth and gravel, thickly covered with a growth of grass. It is this fact which has probably given to these mines their Spanish appellation of "*Minas del mineral de la Escondida*," or hidden mines.

The mines at present worked occupy the most northern point of the mountains, though mineral indications and abandoned excavations are common over the exposed face of the whole mountain range. The various excavations bring to view a very uniform character of formation, first passing through a variable layer composed of angular fragments of rock, imbedded in a dry brown earthy medium. The superficial rock exhibits a siliceous limestone of very close compact texture and dark blue color; to this succeeds the true silver-bearing rock, being a form of subcrystalline limestone showing the action of internal heat, of a much softer texture than the preceding, and of a whitish gray color, (specimen rock, No. 99.)

In this latter rock are exposed the veins of argentiferous galena, frequently extending into the upper siliceous rock, but acquiring its greatest thickness and richness in this lower formation.

The veins of mineral penetrate this rock in the form of variable sheets, dipping regularly at an angle of 45° to the northwest.

Further details in reference to the character and working of these mines, with such reliable mining statistics as could be procured, will be found under a separate head.

From the mines, by a gradual and continuous descent over a wide grassy plain, scattered with low mezquite bushes, we have in view at the lowest depression the valley of the San Miguel or Corralitas river, and the towns of Baranca and Corralitas. This plain, though usually dry,

supports a fine growth of nutricious grasses, and the mezquite bushes, which are scattered over its surface, are the main dependence for the necessary supply of charcoal for smelting operations. To first view, this would seem to offer but a poor supply of this needful article, showing in such situations only a shrubby growth; but owing to a remarkable peculiarity of this variable and wide-spread shrub, it is found that, when growing in such exposed situations, instead of developing a distinct trunk, it forms thick underground stems. These being grubbed up by a class of peon laborers, are disposed in piles to dry, when they become fit for conversion into a superior article of charcoal.

At a distance of 20 miles over the above described plain we reach the valley of the San Miguel river; on the eastern bank of which, at a distance of three miles apart, lie the towns of Corralitas and Baranca. We here encounter a beautiful limpid stream and a fertile valley. At Corralitas, this river, as seen by us in the month of February, and again in April, 1852, had an average width of 30 feet, and 2 feet in depth, flowing over a sandy or pebbly bed between shallow alluvial banks. The season of high water is said to be in September, corresponding with the close of the rainy season; at which time a large portion of the adjoining bottom-land is overflowed, the greater part of which is susceptible of cultivation. The width of this alluvial belt is variable, being occasionally spread out in low marshy tracts, 3 to 5 miles wide; at other places contracted by the encroachment of mountains on either side. Some 16 miles above Baranca, to the south, are the remains of ancient and extensive structures, known as "Casas Grandes," still occupied by a flourishing agricultural settlement under the same name. A similar character of mountain ranges, as before noticed, bound the valley on either side; being, however, composed exclusively of igneous rock, the higher peaks showing generally a basaltic structure. The towns of Corralitas and Baranca are built up exclusively with a view to mining operations, the ore being transported to these places for smelting and refining. Living in a state of constant warfare with hostile Indians, the raising of cattle, or even the cultivation of the soil, is confined to a bare supply of necessaries. Abandoned fields and deserted ranchos are frequently met with, showing a quite recent period of greater prosperity, the decline of which is most evidently due, not to the natural incapacity of the country, but the inefficiency and degeneracy of its population.

In a direction W.N.W. from Corralitas, and about 24 miles distant, is the town of Janos. Our road to this place, after crossing the Corralitas river, leads at first over the wide grassy bottom-land of its western side, here nearly 5 miles in width. From this we pass over a ridge projecting into the valley below, and descend again on its opposite slope, following near the course of the lower valley, and passing over a shrubby plain similar to that before described, forming a sort of table-land gradually sloping toward the river. The town of Janos is situated on a branch of this main stream flowing from the southwest. On reaching the banks of this latter stream, we find a mere rippling brook running over a pebbly bed. A short distance below, its waters are drawn off for the purpose of irrigating the gardens and cultivated fields which occupy the delta formed at the point of junction of the Janos branch with the San Miguel river. The town is situated on the gravelly table-land on the left side of the stream overlooking the river bottom, and set off in the background by a range of high mountains shutting out the view westward. Our route leads directly toward this western mountain range, which is crossed at a low depression, thence descending into still another wide basin plain,

extending in its greatest length from north to south, and bounded on the west by the clearly defined range of the Sierra Madre.

The course we travelled thence lies W.N.W., inclining towards this mountain range, and crossing diagonally the wide basin plain intervening between this and the Janos range of mountains.

About 10 miles from Janos we come upon a singular depressed valley, sunk some 50 feet below the gravelly plain, having a lower alluvial belt about a quarter of a mile in width, which is coursed by a limpid brook, and bordered by a scattering timber growth.

This stream is said to have a lagoon source some three miles to the southwest; thence flowing northeast 10 or 15 miles, it terminates in a marshy lake surrounded by mountains; thus showing a character similar to that before noticed in reference to Lake Guzman and Sta. Maria on a smaller scale.

From this point, following a continuous course W.N.W. (mag.,) the road passes over a gently undulating swell, composed of gravelly table-land, thence crossing a wide, open, alluvial basin, similar in character to those before described.

We then approach the high mountain range of San Luis. Our progress toward the mountain base leads by a gradual ascent till a near approach brings to view deep gullied stream beds, connected with the drainage of the mountain valleys, and terminating on the alluvial plains below. Near their sources in the mountains these ravines contain running water, more or less copious, according to the character of the season.

On reaching the first rocky spurs from the main range, the country assumes a most picturesque character. Clumps of *live oak* (*Quercus Emoryi*) edge the ravines, and are scattered along the mountain slopes. Cedar of a shrubby growth is also frequent, and the usual mountain shrubbery serves to give a character of freshness and verdure to the scenery.

Directly at the mountain base, and forming its projecting spurs, a reddish form of porphyritic basalt makes its appearance, showing a precipitous columned face and tabled summit.

In the recesses of the ravines, as exposed by the mountain torrents, a variable deposite of igneous conglomerate is met with, flanking the central rocky mass. This central nucleus, as exhibited along the sides and summit of the mountain range, is an igneous volcanic product of quite recent origin, and characterized by Professor Hall as "feldspathic lava," exhibiting a granitic appearance. (No. 86.)

At the point where the old road crosses the ridge, called the "San Luis Pass," the ascent is quite abrupt, rising from the plain below 800 to 1,000 feet.

The summit crest commands a most extensive and grand view. Looking eastward, the eye takes in at a glance the wide alluvial plain over which we have been passing, encircled by its irregular mountain boundaries, showing plainly its basin character, and in which here and there stand out isolated mountains, as islands in the broad expanse.*

To the north and south is a continuation of the main ridge, more broken to the north, and apparently forming slopes of easier ascent than the one passed over by us. Quite possibly at several places there may be an easy transition from the plains on one side to those of the opposite slope. To the south the range is more continuous, of a rugged character, and increased height.

* This description was written before the line under the treaty of 1853 was run. It will have been seen in the preceding part of this work that good passes were found to the north and within the limits of the United States. W. H. E.

Westward we look down on another alluvial plain, less distinctly bounded by mountain ranges, and extending to a great distance from north to south. On its western limits, at a distance of about ten miles, this plain abruptly terminates by a slightly elevated terrace, the descent from which to the lower level of the San Bernardino valley forms the well known Pass of Guadaloupe.

Here, then, we have the means of estimating the true character of this great water-shed, in its connexion with the present line of boundary both to the north and south.

Considerable confusion has arisen from the vague terms and expressions employed by writers to describe the peculiarities of this part of the central axis of the North American continent. There has been wanting in their popular descriptions the elements of a general principle, applicable alike to all great dividing ridges. Geological science alone furnishes this element, giving, in the general result of its observations, the best means of elucidating all the points involved, and clearly explaining the several local peculiarities exhibited.

In most of the descriptions hitherto given of this portion of the dividing ridge, we hear in frequent use the stereotype expressions that at or near the point under examination the range of the Rocky mountains becomes "suddenly depressed," or "flattened out," to form the great Mexican plateau. Again, that at some imaginary point south of this great change of topographical features rises another distinct range, called the *Sierra Madre*, continuing thence to form the line of cordilleras extending to the extreme of the continent.

Now, such descriptions as these embody no clearly defined principle of geological science, and contain, moreover, errors of fact.

The Spanish name of *Sierra Madre* (literally *mother mountains*) is the general term in use to describe what is called a *dividing ridge* with us, and its special application to the range under consideration is due to the important character of this divide as the *mother range* of the continent.

Now, it is well known that all extended continental ranges are due to a line of internal disturbance, of varying intensity at different points, but in all alike characterized by the protrusion of various igneous products, together with the uplifting of adjacent stratified deposites, either altered in texture by the action of internal heat giving rise to the various metamorphic products, or showing the action of an uplifting force only in changes of inclinatian or dip of the strata.

Most naturally, then, in view of the numerous and varied agencies at work, should we expect changes of character at different points of the same range, corresponding to points of greater or less intensity of the internal disturbance, or the different products erupted or exposed to alteration. Hence occur elevations and depressions, and variety of formation in the course of the same continued range.

With this principle in view, we have a ready explanation of all the peculiarities exhibited in the portion of the range under examination.

Thus the igneous products are mostly of modern origin, exhibiting various volcanic products in the form of granitic lavas, porphyritic basalts, and amygdaloid traps. These products show a very variable character of exposure, forming ranges irregular in their direction, and differing in composition.

These several mountain ranges cover more or less the entire face of the country, including the dividing ridge only as one member of the general series.

The natural explanatory inference from these facts is, that the internal force, here represented in the continued mountain range, was diffused over a large space, and not centralized on one particular line. Hence arises no great prominence of one central chain, but a number of independent ranges, serving to equalize the general elevation and give the character of an elevated plateau to the surface of the country.

Again, the same irregular action of the internal force, and especially the preponderance of recent eruptive products, favors a varied direction of the mountain ranges, by means of which areas are circumscribed and basins formed for the reception of aqueous depositions. Here, then, we see the origin of those extensive plains and stretches of table-land to which our attention has been so frequently directed in the preceding sketch.

These same characters probably apply more or less closely to many other localities connected with the general dividing range, whether north or south of the point we are examining.

We are now prepared to descend the western slope of this dividing ridge, and note the peculiarities of feature presented on our route westward.

Decending, then, by an equally steep slope as the eastern ascent, and about the same height, we come upon the alluvial plain below. The lowest depression of this plain is composed of a light alluvial soil, and thence sloping gently upward to the west, exhibits a gravelly deposit, till, at a distance of about eight miles from the base of the mountain just left, we come upon the abrupt descent of the Guadalupe Pass.

This noted pass, which has been so frequently traversed on the line of emigrant travel to California, is now so well known as hardly to need a detailed description.

This pass has been properly characterized as the first step of considerable descent from the Mexican plateau to the heads of valleys leading to the Californian gulf. It has now been clearly established that at a point farther to the north, near the parallel of 32° latitude, the descent westward may be accomplished by a more gradual slope, and without leaving the basin of drainage pertaining to the Gila river.

The geological structure exposed in this mountain pass is similar to that before noted as occurring in the upper slope of the Sierra Madre, including feldspathic lava, granitic in texture, associated with basalt, stratified porphyry, and closely cemented breccias.

These several forms, variously associated, serve to give a remarkable diversity and broken character to the rock exposure, presenting a confused outline of mingled crests, peaks, and ravines. Through these the road has to work its way by sharp turns and very steep descents. On attaining a lower level we pass down a ravine, gradually widening, which finally spreads into a small valley, watered by a fine running stream, and beautifully shaded by large sycamore and cotton-wood trees. This valley is closely hemmed in by steep rocky walls, marked by intricate ravines, and rendered picturesque by a varied assemblage of *live oak*, *cedar*, and other verdant shrubbery. In emerging from the higher points of the mountain range, the walls of this cañon exhibit various forms of stratified porphyry running into a breccia. The character of stratification has, at several points, a close resemblance to altered sedimentary deposits, showing a reddish color and a very uniform character of dip.

We finally leave this valley, mounting up a steep bank, composed of gravelly table-land, rising 200 feet above the bed of the stream, thence passing by a gradual and continuous slope toward the main valley of the San Bernardino. The table-land here has all the usual characters of this

formation in other parts, not differing essentially from that of the Rio Bravo or Gila valleys, and terminates by an abrupt bank, bounding the alluvial basin below.

This basin, forming, as it is said, the head of the Yaqui river, here shows a wide flat plain, extending from north to south, and having a breadth of three to five miles. On its western edge is situated the deserted settlement of San Bernardino. Adjoining this rancho are numerous springs, spreading out into rushy ponds, and giving issue to a small stream of running water. The valley is covered thickly with a growth of coarse grass, showing in places a saline character of soil. The timber growth is confined to a few lone cotton-wood trees scattered here and there.

Signs of previous cultivation are limited, this settlement having been engaged principally in stock raising. The numerous bodies of wild cattle now running at large over this section of country are the remains and offspring of domestic herds, now widely scattered and hunted by Indians.

The western side of the valley is precisely similar to its opposite, showing the same general character of gravelly table-land. This leads by a gentle ascent to a low point in the dividing ridge separating the valleys of San Bernardino and Aqua Prieto.

A remarkable tower-shaped peak rises in the centre of this ridge, a short distance south of the road, forming a conspicuous landmark. This ridge is seen to be composed of one or more of the variable forms of volcanic products so often noticed heretofore; the prevailing character is here a reddish brown granitic mass.

The descent on the opposite (western) side of the ridge to the alluvial bed of the Aqua Prieto is over a long, tedious slope, the gravelly table-land giving place to extensive tracts of clay or loam, supporting a patchy growth of coarse grass. The "Black Water" valley, at its lowest depression at this point, contains no constant running stream, its course being mainly occupied with low saline flats or rain-water pools. Extensive lagoons are said to occur in this valley a short distance south of where the road crosses.

The main tributary to this valley comes from the west, and is followed to its head on the line of wagon-road. Its bed consists of a wide ravine, coursing through pebbly strata, variously marked by the washings and drift deposits, caused by the occasional strong current derived from local rains. At other times its bed is entirely dry. The timber growth along its borders consists of hackberry and walnut.

At its source there is a fine spring, issuing from ledges of stratified porphyritic rock, identical in character with that noticed at the foot of the Guadalupe Pass. The stratification is inclined to the northeast, and along the line of its tilted ledges the spring issue forms frequent pools of limpid water.

From this point we pass in a circuitous course to the southwest, winding among rocky spurs, and thence passing up an upland valley, agreeably diversified with groves of live oak and covered with luxuriant and nutritious mountain grasses. On this route we pass gradually to a divide which leads, on its western aspect, to an eastern branch of the Upper San Pedro valley.

The country here begins to assume most attractive features. To the north and west rise high mountain ridges clothed with pine and oak groves; the intervening country is everywhere carpeted with fine grama grass, the nutritious quality of which is exhibited in the well-conditioned character of the numerous wild horses and cattle that luxuriate over this favored region. Water

is frequent in the valleys, and everything indicates a capacity for cultivation, the grazing capabilities being unequalled by any tract heretofore passed over.

Beyond this the San Pedro valley spreads out in diverging branches to the east and west, thus drawing tributary a very extended mountain drainage.

It is this latter character which sufficiently accounts for the fact that the San Pedro is the only branch of the Gila River, coming from the south, which furnishes an uninterrupted stream of running water along its whole course.

At the point where the main valley of the San Pedro is reached we find an alluvial belt, variable in width, and occasionally marshy. These bottoms are flanked by terraced table-land of unequal heights, composed of a hard gravelly soil, and supporting a close sward of grama grass, giving a peculiarly smooth shorn look to the general face of the country.

Occasional exposures of igneous rock, or the projecting spur of some mountain ridge, serve to diversify the scene; and quite constantly in the higher branch valleys is exposed a form of igneous conglomerate. This latter formation is exposed in irregular bluffs along the edges of these valleys, presenting washed faces and precipitous walls crowned with terraces. These higher points are frequently set off with the remains of deserted dwellings, plainly located with a view to defence. Other eminences, commanding extensive views, are occupied by rocky breastworks, serving the double purpose of watch-towers and strongholds of retreat. Associated with these are also extensive rocky enclosures, in which the cattle were secured. All these points are suggestive of the condition of constant warfare to which this commencing civilization was subject, and under which it was at last obliged to succumb.

These upland valleys are only sparsely wooded by occasional cotton-wood or walnut trees. As we approach the mountains, however, the timber growth becomes more abundant, and the lower ridges are occupied by extensive groves of oak, which, on the higher points, are associated with pine and cedar.

From the head of the "Nutria" (southwest) branch of the San Pedro, up which our road passes, we commence the steep ascent of the mountain ridge lying between the Santa Cruz and San Pedro valleys. The character of this range is exactly similar to what we have before described as pertaining to all the higher mountains passed over on our route, west of the Sierra Madre.

The height of the pass leading to Santa Cruz is not less than 1,000 feet above the respective valleys on either side, being equally steep and rugged on either slope. The same ridge, extending toward the south and southwest, forms a continuous line of high mountains, lying between the San Pedro and Santa Cruz valleys; the preferable route for crossing is probably that taken by Col. Cooke in 1846.

The upper route, being the one more commonly followed, strikes the Santa Cruz valley near its head source.

The direction of this valley is at first nearly due south, giving the idea that its drainage is on the line of the rivers flowing south to the California Gulf. It is indeed so laid down on most of the maps of this region, but this is manifestly incorrect. About three miles south of the town of Santa Cruz the valley makes a sharp elbow; thence doubling on its former course, it continues north and northwest, being the same valley in which, lower down, are

located the towns of Tubac and Tucson; thence leading toward (though probably hardly ever reaching) the Gila River, near the Pimo settlements.

The situation of the town of Santa Cruz is highly picturesque, lying embosomed amid lofty wooded mountains. Its soil is fertile, abundantly watered, and susceptible of easy irrigation; its elevation gives it a cool temperature, suited to the production of northern fruits and cereal grains.

A cut-off, over the mountain range intervening between the two courses of the river, leads, by a distance of 18 miles, to a lower part of the valley, maintaining in the main the same general features, but showing a marked change in the climate. This latter fact becomes still more apparent in our progress downward, as shown by the comparative forwardness of vegetation. Thus a short journey of three days (or 80 miles) from Santa Cruz, between February 27th and March 1st, 1852, showed a difference in the advance of vegetation equal to a full month in time; so that while at Santa Cruz the cotton-wood trees were barely budding, the first day's journey displayed their loose catkins, the second the opening leaf, and the third the full leaf.

Greater aridity also characterizes the lower portion of the valley, and the live oak, so common above, gives place to heavy growths of mezquite. The adjoining mountains on either hand become in great measure bare of trees, and present steep ledges of igneous rock exposed along their broken range. The immediate edges of the valley are flanked by a conglomerate formation, similar to that noticed on the Upper San Pedro. Accompanying these changes the stream contracts, and finally, in certain points along its course, ceases to run, and the usual desert features of all waterless tracts in this region are exhibited.

We thus pass the settlements of Tomocacori, Tubac, San Xavier, and Tucson, together with numerous deserted ranchos occupying various points along the valley. After leaving Tubac, which is situated about midway between Santa Cruz and Tucson, the valley expands into a wide open basin, the mountains receding on either hand, and the dry valley, now almost exclusively occupied by mesquite, is bordered by a wide stretch of gravelly table-land. On this table-land we meet, for the first time on our route, that most remarkable vegetable production, the *Cereus giganteus*. Further on it becomes abundant, its stiff trunks and branched arms rising up here and there like sentinels, and giving a most peculiar character to the landscape scenery.

Approaching the town of San Xavier, noted for its superb church, contrasting strangely with the mud hovels surrounding it, we again come upon running water, with its constantly associated fertility and verdure. In this vicinity occur rocky knolls, composed of a dark-colored trap-rock, which formation becomes still more largely developed in the vicinity of Tucson, forming extensive ridges having a tabulated form and very irregular outline.

The settlement of Tucson occupies the lowest line of constant running water, and consequently the last fertile basin lying in the course of this valley. Below this, on the north, succeeds the extensive desert tract lying between Tucson and the Gila River.

In pursuing our course down the valley, the adjoining table-land gradually merges into the desert plain over which our road passes. Hardly, however, did it seem to deserve the name of a desert at the time of our crossing it. Owing to the refreshing influence of recent rains, a rapid growth of evanescent flowers gave its otherwise barren surface the aspect of a flower garden, regaling both the sense of sight and of smell with a profuse and varied assemblage of tints and scents. Water sufficient for our animals was found in ravines by the side of the road, and

a journey of eighty miles, otherwise dreaded, was, by an agreeable disappointment, rendered highly pleasant. Our journey was made in the first week in March; doubtless another month might have changed its features materially.

Our course lies quite regularly to the northwest, a broken line of mountains lying on our left, while to our right lies the extensive high mountain range northeast of Tucson. Directly in our course is a singular pinnacled peak, being the "half-way point" between Tucson and the Gila; approaching this, we pass by a gradual ascent over a gentle ridge, forming a depressed point in a continuous mountain range extending from the pinnacled peak, on our left, northeast toward the Gila valley. Near the summit of this ridge we pass small alluvial tracts, then occupied by a luxuriant growth of young grass, and cut up by deep gullies containing abundant supplies of rain water. The rock exposure here has a more ancient appearance than any before passed, indicating an approach to the granite ranges of the Californian Cordilleras.

We descend the northern slope of this ridge, passing over extensive clay flats washed by recent rains into frequent gullies, these finally centering in one form the irregular bed of a rain stream leading direct to the Gila river.

The portion of the Gila valley thus reached is where the river, emerging from the high mountains occupying the mouth of the San Pedro, spreads out into the extensive alluvial bottoms, occupied in part by the settlements of the Pimo and Maricopa Indians.

The gravelly table-land here forms a gentle slope, leading from the distant mountains, and indenting the alluvial belt below. This latter consists of an upper level, supporting a shrubby growth of mezquite, and a lower bottom subject to river overflows. On these upper portions the Indians usually construct their dwellings, thus overlooking the lower cultivated fields. The amount of land here capable of cultivation is quite extensive, forming a belt on each side of the river often several miles in width, and extending east and west for 20 miles or more.

The stream of water, then at its average height, (in early March,) measured about 40 yards in width with an average depth of 2 feet, the volume, however, being considerably diminished by the extensive irrigating ditches drawn from above.

The line of the river bank is at this season set off with lagoons and marshes, and everywhere bordered with a dense willow growth, rendering it difficult of approach.

The dams, which serve the purpose of drawing off the irrigating water, are constructed of old willow trunks and snags; these, in the course of time, entangling the loose soil and sediment borne down by the river, furnish a bed for the willow growth, thus becoming more permanent with age.

From a rock knoll of true granite, abutting on the river on the American side, a fine view is obtained of the general character and external features of this interesting locality.

The character of the Gila valley, from this point down to its mouth, did not come under my personal inspection. All accounts represent a great uniformity of general features already sufficiently detailed.

Thus we have a succession of basins, limited by mountain barriers, through which the river forces its way, forming cañons of greater or less extent.

These basins are again occupied by more or less extensive stretches of gravelly table-land, representing the desert features of this region; through these are marked the alluvial tracts,

varying in width and character according to the geological conditions surrounding them; through this the river works its sinuous course, with a swift current and turbid water, till it empties into the Colorado of the West.

IV.—MINERAL PRODUCTIONS OF THE REGION OF COUNTRY, IN CONNEXION WITH THE MEXICAN BOUNDARY LINE, FROM THE MEXICAN GULF COAST TO THE COLORADO OF THE WEST.

[NOTE.—This report was written before the treaty of 1853, and applies more particularly to the old boundary under the treaty of Gaudalupe Hidalgo.]

The mineral productions of the region of country, in connexion with the United States and Mexican boundary line, are necessarily various, as corresponding to the different geological formations. The detailed examinations necessary to furnish a satisfactory estimate of the real value of this class of products are still wanting, and the peculiarities of the country itself place great obstacles in the way of arriving at clear results.

Among the most important, which we may here briefly enumerate, are: *First.* Such as are connected with the various forms of igneous and metamorphic rocks, including *Copper*, *Gold*, *Silver*. *Second.* Such as pertain to the stratified or alluvial deposites, including *Coal*, *Salt*, *Gypsum*.

FIRST CLASS.

COPPER is quite frequently found in connexion with porphyritic rocks. The most usual form of the ore is that of *green malachite* and *red oxide*. The locality best known is that of *Santa Rita del Cobre*, which was profitably worked about 20 years ago. Analysis of ore from this locality exhibited a yield of $75\frac{38}{100}$ per cent. of copper.—(See analysis by Professor T. Antisell.)

No mine of copper is at present worked in any part of the region under examination.

GOLD is said to be sparingly found at various localities, in connexion with diluvial deposites, derived from adjacent igneous rocks. It is here met with in a finely disseminated state, and has never yet been found in sufficient quantities to yield a fair return for the labor expended. It would seem here to belong to the same character of formation as that of Mexico, associated with forms of porphyry, and never to approach in richness the deposits of California; such, indeed, we would expect in the general absence of metamorphic slates and quartz veins, so well known to be the most prolific source of gold in other regions. But one locality of the true gold-producing rocks was met with on our route, and that was at the furthest western point, near the Pimo villages, on the Gila.—(Specimen rock, Nos. 97 and 98.)

SILVER.—Silver ore is found at several localities, mostly on the Mexican side of the line. It has also been found in the Organ Mountains and various portions of southern New Mexico. The localities best known in Mexico adjoining the boundary line occur at Corralitas and Presidio del Norte, in the State of Chihuahua, and at Santa Rosa, in the State of Coahuila. The only one at present successfully worked is that at Corralitas, before referred to. The ore from which the silver is obtained is a form of *Argentiferous Galena*, containing very variable proportions of silver. According to the statement of the principal proprietor of these mines, *Mr. Flotte*, the average yield of the best mineral is 0.50 per cent. of silver; analysis of a single specimen by *Professor Antisell* gave only 0.03 of one per cent., a discrepancy difficult to account for, except on the supposition that the ore varies remarkably in the relative amount of contained silver.

The working of these mines is carried on in a very rough manner. The excavations simply commence with the surface exposure of the veins, thence following them down by rude and irregular shafts, inclined according to the dip of the vein, at an angle of 45° to the northwest. The ore is extracted by blasting, both the mineral and the refuse material being brought up on men's backs. Where the depth is such as to cause an accumulation of water the mine is abandoned.

The richest of these distinct mining excavations is that called *"San Pedro."* This, when visited in 1852, had attained a depth of eighty yards. The mineral vein, as exposed along the line of excavation, exhibited a very variable thickness, from one to twelve inches; the character of the ore and its specific gravity also varied at different points.—(See description and analysis by Professor T. Antisell.)

The mode of extracting the silver is by a double process of *smelting* and *refining*. By the former the ore is reduced, by the means of a common furnace, to the form of an alloy of lead and silver. In the refinery the lead is removed by burning it out in a blast furnace, leaving the silver in the shape of irregular cakes, weighing about eight ounces each. The refining process occupies about twelve hours.

The following information in reference to the working of two of the principal mines and reducing establishments and the amount of silver produced is furnished by the proprietor, *Mr. Luis Flotte, of Baranca.*

The mine of San Pedro employs about forty men, whose wages average $10 per month. The amount of ore extracted by this number of men monthly is from 160 to 200 loads, of 300 pounds each. This is calculated to yield from 24 to 32 ounces of silver per load. The average monthly expense of working this mine is about $1,000.

The mine of Leon employs about the same number of men, and requires the same expense of working, viz: $1,000 per month. The amount of mineral extracted from this mine is about 500 loads per month, of 300 pounds each, estimated to yield three ounces of silver to the load. This ore is chiefly valued as a flux to assist in the reduction of the richer mineral.

Smelting Establishments and Refineries.

There are two of each of these establishments in operation at Baranca. The number of men employed in all the necessary labor, including hauling the mineral, manufacture of charcoal, &c., is 125. The average monthly expense is $2,000.

When in full operation, the amount of ore smelted is 180 loads of San Pedro ore, and 500 loads of Leon mineral, of 300 pounds each. Total, 204,000 pounds per month.

The yield of silver for this amount of ore would be an average of 420 pounds, at $16 per pound, equal to $6,620, leaving a profit for capital invested of $2,620 per month. The total amount of silver produced at this mining location for six years ending January 1, 1852, as given by the two proprietors, is—

Mr. Luis Flotte, at Baranca	$340,000
Señor Don José Maria Zuloaga, at Coralitas	146,000
Total	486,000

COAL.—A remarkable form of coal, closely resembling *cannel coal*, is found in connexion with the cretaceous strata on the Rio Grande, being exposed at several points along the course of the river from the mouth of the Pecos to Laredo. The character of the formation and economic value of the product, as an article of fuel, will be given in the report of Mr. Schott.

SALT occurs in connexion with salt lakes, occupying depressed portions of the wide desert tracts, to which the term of *Llano Estacado* is applied. The product is more or less pure, and in greater or less abundance, according to obvious local causes.

GYPSUM occurs in connexion with marls, belonging either to the upper Tertiary, or alluvial series of deposits. In such situations it frequently forms very extensive beds, composing the main bulk of local table-land exposures.

In concluding this report, I have to express my special obligations to Professor James Hall, of Albany, who has kindly favored me with his views of the geological collections of the survey, and otherwise rendered assistance in making out this report. Similar acknowledgments are due to Professor John Torrey, of New York, in reference to the botany.

Especially, in this final conclusion of my duties on the Mexican boundary survey, are my sincere thanks due to Major W. H. Emory, with whom I have been directly associated, in field and office duties, for the last five years, a length of time signalized by repeated and considerate acts of kindness on his part, as my superior officer, and gratefully remembered on mine.

Respectfully submitted.

C. C. PARRY, M. D.,
Botanist and Geologist U. S. B. C.

I consider the present a proper place to insert the analysis of minerals, not only of those referred to by Dr. Parry in the above memoir, but those which were collected in the new Territory subsequently to his withdrawal from the commission.

In the Organ Mountains, near Fort Fillmore, and at several other places along our route, silver mines have been opened by enterprising Americans, but I have not obtained analyses of the minerals procured at them, for the obvious reason that the experience of the miner will be a more valuable test of the value of the mine than any which can be afforded by specimens.

Nothing can be a more fallacious test of the value of a mine than the analysis of pieces of ore taken at random from the metallic vein, as most of these have been. Its true value can only be arrived at by actually working the mine, which, for the purpose of experiment, may be carried on upon a very limited scale.

Those familiar with the localities will see in the analysis that specimens from veins of known value are here exhibited as yielding a very low per cent. of precious metal. These specimens are therefore not fair examples of the whole.

When at Janos, I observed the inhabitants collecting nitre from the soil by the rudest process, and was informed that all the powder used in blasting at the mines of San Pedro was manufactured from the nitre thus obtained. The soil, in many places almost destitute of vegetation, is no doubt surcharged with this substance, and a portion of soil was collected to be analyzed, and

has been mislaid. In view of the difficulty experienced in obtaining this substance in time of war, the subject is well worth the attention of government.

Many of the earths and rocks were placed in the hands of my lamented friend and classmate, Professor J. W. Baily, for microscopic examination. His state of health did not permit him to go entirely through with the examination. He, however, had made some progress, and I here give a short and characteristic note from that eminent and beloved gentleman, which gives an interesting summary of the results of his investigations up to that time.

W. H. E.

West Point, N. Y., *April* 2, 1856.

Major W. H. Emory, *Commissioner U. S. M. Boundary Survey.*

Dear Major: This time we have some luck. Three of the specimens last sent prove quite interesting. They are Nos. 18 and 19, from cretaceous strata, Leon creek and Leon spring, West Texas, and No. 23, travertin-like crust, from bed of San Pedro.

The specimens Nos. 18 and 19 are interesting, as containing a considerable number of fossil Polythalamia, (microscopic calcareous shells,) and still more so from yielding fine *green sand* casts of the same minute forms. This fact of the occasional formation of green sand in the cavities of minute shells was discovered by Ehrenberg, and I have verified it in specimens from several American localities. I would be glad to get a good supply of Nos. 18 and 19 for further study.

The travertin-like crust, No. 23, has an organic basis. When treated with chloro-hydric acid, it leaves a spongy mass, greater than the original volume, and composed of plants belonging to the genera Oscillatoria, Hydrocoleum, &c. There are several of these plants which delight in calcareous waters, and always incrust themselves as in the specimens you have sent.

With regard to the moss agates, I cannot satisfy myself that the filamentous mosses in them are really of confervoid origin. If they were, it is now impossible to distinguish a single vegetable cell. I incline to the belief that they are rather concretionary deposits of oxide of iron, which may possibly have had organic nuclei to collect upon; but if so, these last have disappeared.

The cretaceous earths attached to the Texian fossils will be well worth further study, and any which have specks of green sand in them will be particularly interesting.

Yours, very truly,

J. W. BAILEY.

New York, 13 *Mercer street, January* 31, 1854.

Three samples forwarded for analysis:

No. 1. Silver ore from San Pedro mine.
No. 2. Ore from copper mines.
No. 3. Ore from Leona mines.

No. 1.—Argentiferous galena; partly granular, chiefly fibrous; specific gravity 603. It contains iron pyrites, disseminated in small cavities.

The amount of silver was determined by moist analysis. Two grammes of ore were treated with nitric acid; to the clear solution hydrochloric acid was added—the resulting cloride of silver fused. The lead was determined as carbonate, by adding carbonate of soda to the solution, after separating the silver. Some adhering earthy matters remained undissolved by the nitric acid.

Analysis yielded in 100 parts:

Insoluble silicates	4.50
Lead	82.20
Sulphur	12.79
Oxide of iron and traces of copper	.46
Silver	.03
Loss	.02
	100.00

Indicating a yield of 6¼ ounces of silver per ton.

No. 2. *Red copper ore.*—Massive; specific gravity 5.10; of a deep liver red color in fresh fractures, coated on the outside with a crust of green malachite, to the depth of $\frac{1}{10}$ of an inch; dissolved with slight effervescence in nitric acid; it fur-

nishes water when heated in the test-tube, arising from the presence of the hydrated carbonate. The copper was determined as oxide by treating the acid solution with caustic potass.

In 100 parts:

Water and carbonic acid	4.70
Oxide of copper	95.30
	100.00

or yielding 75$\frac{85}{100}$ per cent. of copper.

No. 3. *Brown iron ore.*—Ochreous variety; specific gravity = 3; yields but little water in the tube; effervesces slightly in hydrochloric acid. The iron was determined as peroxide by precipitation with ammonia.

In 100 parts:

Organic (vegetable) matter and water	7.80
Insoluble earthy matter, (clay)	15.00
Peroxide of iron	70.70
Lime	5.05
Magnesia, Carbonic acid	1.00
	100.00

Yields 49 per cent. of metallic iron.

THOMAS ANTISELL, *M.D.*

SMITHSONIAN INSTITUTION, *Washington, March* 1, 1856.

SIR: I have the honor herewith to submit to you the results of the examination of salts, ores, and minerals, made by me for the United States Mexican Boundary Commission. The analyses were made in the laboratory of this institution. The numbers correspond with those attached to the original labels. The ores, though few in number, are of such a character as to raise high expectations of the mineral wealth which thorough exploration will develope in the region traversed by the commission.

No. 15. Argentiferous galena, from the copper mines of Santa Rita, in New Mexico. The specimens examined are very fine-grained galena, containing scattered particles and nodules of iron and copper pyrites, with some oxide of iron, resulting from the oxidation of iron pyrites. One of the specimens contains adherent portions of the gangue from both sides of the vein, showing it to have been, at this spot, 1 to 1½ inch in thickness. It yielded 73.75 per cent. of lead. The mean of two accordant assays, by cupellation, gave 0.365 per cent. of silver. The copper in both this and the following specimen is so unequally disseminated, that it was impossible to obtain a fair average without destroying the specimen. The amount of copper in both ores is small.

No. 16. Lead ore, from the silver mines of San Pedro, in Chihuahua. The specimens furnished me do not, probably, represent fairly the richness of the mine. They are very unequal in composition and value, consisting of galena, mixed with zinc blende, quartz, iron pyrites, and a little copper pyrites. A sample, which was regarded as affording a tolerably fair average, yielded 28.29 per cent. of lead. The mean of two assays gave 0.70 per cent. of silver.

No. 18. A white saline substance, occurring as an incrustation on the soil, at Salado spring, in Chihuahua. It dissolves in water, leaving only a small residue of white sand, containing calcareous particles. It consists chiefly of chloride of sodium, (common salt,) with a considerable quantity of sulphate of soda, and small quantities of sulphate of magnesia, chloride of magnesium, and sulphate of lime. The presence of nitrates could not be detected. If this salt occurs in sufficient quantities, it will prove a very valuable source of supply of table salt, the want of which is strongly felt in this region. The presence of sulphates of soda and magnesia renders it unfit for use in its present state, but it might easily be freed from these impurities by solution and re-evaporation. The sulphate of lime is precipitated, in combination with sulphate of soda, as pan-stone, when the saline solution attains a certain degree of concentration. If the concentration be not carried too far, chloride of sodium crystallizes out almost pure. The mother liquor contains in solution the rest of the chloride of sodium, with sulphate of soda and salts of magnesia. It is highly probable that the springs which deposit this salt, by natural evaporation, contain, in solution, enough salt to be used as salines. The waters might be concentrated to a greater degree by being made to pass over piles of twigs, in graduation houses, as is commonly done in Germany. A great saving of fuel is thus effected. Analyses of the mineral waters of this country would probably lead to many important economic applications.

No. 18. Is merely the same salt as the last specimen, taken from a depth of six inches below the surface. The proportion of sand and gravel in it is much greater, but it shows that the whole soil is impregnated with saline matters.

No. 19. Copper ore, from Boca Grande, in Chihuahua. This is a very beautiful and pure specimen of red oxide of copper, intimately mixed with native copper. It is entirely free from sulphurets and earthy minerals. The exterior is partially covered with a thin crust of malachite—green carbonate of copper. This ore yielded, in an assay conducted in the moist way, 94.8 per cent. of copper. A very similar ore has been described by Mr. Blake, as occurring near Altar, in Sonora.* The compact subcrystalline appearance of this ore gives evidence of a massive deposit.

* United States Pacific Railroad Survey, (partial route in California,) under the command of Lieut. R. S. Williamson, Top. Eng., 1853. Preliminary report by William P. Blake, geologist and mineralogist, p. 75.

No. 23. A compact, white, feldspathic rock, from the valley of the San Pedro river, in Sonora. Before the blow-pipe it exhibits all the reactions of a felsite or fine-grained porphyry. The texture is compact, resembling the base of porphyry without the crystals. The surface exhibits numerous small cavities, resulting, perhaps, from the decomposition of crystals of feldspar.

No. 24. A yellowish pulverulent substance, described by Dr. C. B. R. Kennerly as occurring in a mountain gorge between abrupt walls of volcanic rock. When treated with acid it effervesces strongly, showing the presence of carbonate of lime. After the effervescence has ceased, the residue does not seem to be much acted upon by hot concentrated acids. Before the blow-pipe it fuses with difficulty to a white enamel, owing probably to a combination, at this high temperature, of the silica and lime present. Water takes up from it a considerable quantity of saline matters, consisting of sulphates of lime and magnesia, with traces of chloride of sodium and chloride of potassium. If this be a volcanic ash, as its appearance and mode of occurrence suggest, the presence of the saline matter and carbonate of lime must be attributed to the subsequent action of mineral, probably thermal, springs containing these salts in solution.

Very respectfully, yours,

JOHN D. EASTER,
Ph. D., Chemist and Mineralogist.

SMITHSONIAN INSTITUTION, *Washington, April* 11, 1856.

SIR: I have the honor herewith to report the result of my examination of the ores and coals submitted to me for analysis. Those the locality of which is not given belong to the collection obtained by you from a "prospecter," who refused to reveal the precise locality in which they were found. The rest were collected by Mr. A. Schott.

No. 1 is a lignite taken from cretaceous strata, covered by trap, at Santa Rosa, Coahuila. The specimen has a brilliant lustre, even fracture, and shows no trace of woody structure. The streak is brown. It is free from pyrites. Fragments of it heated to redness in a closely covered crucible lost 30.45 per cent. of water and bitumen, leaving 69.55 per cent. of coke, which was very porous and had a brilliant metallic lustre. The same specimen completely incinerated yielded 24.22 per cent. of ash.

No. 2. Lignite; a dull, lustreless specimen, otherwise quite similar to the preceding. Treated in the same way, it yielded 51.2 per cent. of coke, and 16.8 per cent. of ash, of a reddish color. No pyrites was observed in it.

No. 3. Lignite; in all respects similar to the preceding. It gave 45.5 per cent. of coke, and 15 per cent. of ash. This is the best of these coals. The great amount of ash which these specimens contain renders them of little value as fuel where wood can be had, but in the treeless region where they occur they may be very useful if the beds are extensive and occur at a small depth below the surface; as the specimens were probably taken from the outcrop, it is not unlikely that the seams, when further worked, will improve in quality.

No. 4. A lignite from Lake Guzman, in Chihuahua, containing a large proportion of iron pyrites, which, by the action of the atmosphere, has been decomposed and converted into sulphate of iron. It is entirely worthless.

No. 5. Water-worn pebbles of red oxide of iron, mixed with much silica, from Los Nogales, near the intersection of the parallel 31° 20′ north latitude, with the 111th meridian. The specimen which I assayed yielded 32 per cent. of iron; the assay was made by Penny's process, with bichromate of potash.

No. 6. Two small specimens of red hematite, mixed with specular iron ore and quartz, yielding 37 per cent. of iron.

No. 7. Carbonate of lead, associated with earthy black oxide of magnesia and iron ochre. This is a very unusual association of minerals. The magnesia contains no cobalt, as is the case in a similar ore occurring at Mine la Motte, in Missouri. The specimen yielded, in an assay conducted in the wet way, 17.04 per cent. of lead.

No. 8. Malachite, (carbonate of copper,) enclosing a core of red oxide of copper, containing a few particles of native copper. It yielded 67.76 per cent. of copper.

No. 9. Red oxide of copper, containing a considerable proportion of native copper, in threads and crystals. The specimen is created superficially with malachite, and is precisely similar to the ore No. 19, from Boca Grande, described in my former report. It will yield about 95 per cent. of copper.

No. 10. A specimen of black oxide of copper, associated with silicate of copper and silica. The mean of two assays gave 50 per cent. of copper.

No. 11. Black oxide of copper, mixed with some sulphuret of copper and quartz, from the Sierra Tule, in Sonora. This is very similar to the last specimen. It yielded 57.66 per cent. of copper. No silver was found in it.

No. 12. Red oxide of copper, associated with malachite and small particles of native copper, from the Arizona mines, in Sonora. The mean of two assays gave 74.96 per cent. of copper.

No. 13. A compact silicious ore, containing galena, sulphurets of copper, and arsenical pyrites, intimately mixed with quartz and calcareous spar. It yielded, in an assay conducted in the wet way, 41.84 per cent. of lead; 0.12 per cent. silver; and 2.8 per cent. copper.

No. 14. Galena, associated with variagated sulphuret of copper, carbonate of lead, and quartz. Very slight traces of silver were detected by hydrochloric acid. The specimen yielded 50.4 per cent. of lead, and 4 per cent. of copper.

I have the honor to remain, very respectfully, yours,

JOHN D. EASTER.

SMITHSONIAN INSTITUTION, *Washington, June 2, 1856.*

SIR: I have the honor to report herewith the results of my analysis of the mineral water brought by the Boundary Commission from Mier, and of a sedimentary deposit said to be taken from a spring in the same vicinity.

The water was contained in two bottles, obtained at different times, one by yourself, the other by Mr. A. Schott. The whole quantity not exceeding one quart, it was impossible to do more than determine the quantity of the more abundant ingredients and the presence of some others. A thorough and minute analysis of a mineral water cannot well be made with less than two to five gallons of water, some of the ingredients being present in exceedingly minute quantities, and yet, doubtless, exerting an important influence on its medicinal properties. The analysis was conducted essentially after Fresenius' method.

This water belongs to the class of neutral salines, the most abundant salt being chloride of sodium. Its specific gravity is 1.003.

A qualitative analysis proved the presence of the following substances: Silica, iron, alumina, lime, magnesia, soda, sulphuric acid, chlorine, phosphoric acid, iodine, and carbonic acid.

It is called a sulphur water, but I could not detect the presence of any trace of sulphuretted hydrogen. It has no reaction on test paper, and its taste is decidedly saline.

The result of the quantitative analysis is as follows:

The whole amount of solid matter is 0.6763 per cent., consisting of—

Silica	0.016586 per cent.
Protoxide iron	0.000754 per cent.
Alumina	traces.
Lime	0.009389 per cent.
Magnesia	0.009580 per cent.
Sodium	0.243323 per cent.
Chlorine	0.340470 per cent.
Sulphuric acid	.010180 per cent.
Phosphor. acid	traces.
Iodine	traces.
	0.630282

Combined in the following manner:

Silica	0.016586
Sulphate of lime	0.017306
Carbonate lime	0.004041
Carb magnesia	0.020120
Carb. protoxide of iron	0.001214
Chloride of sodium	0.628560
	0.687827

The yellow powder (marked No. 25) is a deposit from a chalybeate spring. It was supposed from its color to contain a large quantity of sulphur, but this color is due to hydrated oxide of iron. When ignited, the mass assumed a bright red hue. No sulphur is present in it, but it contains considerable quantities of sulphates and chlorides of lime, magnesia, and soda.

I have the honor to remain, very respectfully, yours,

JOHN D. EASTER.

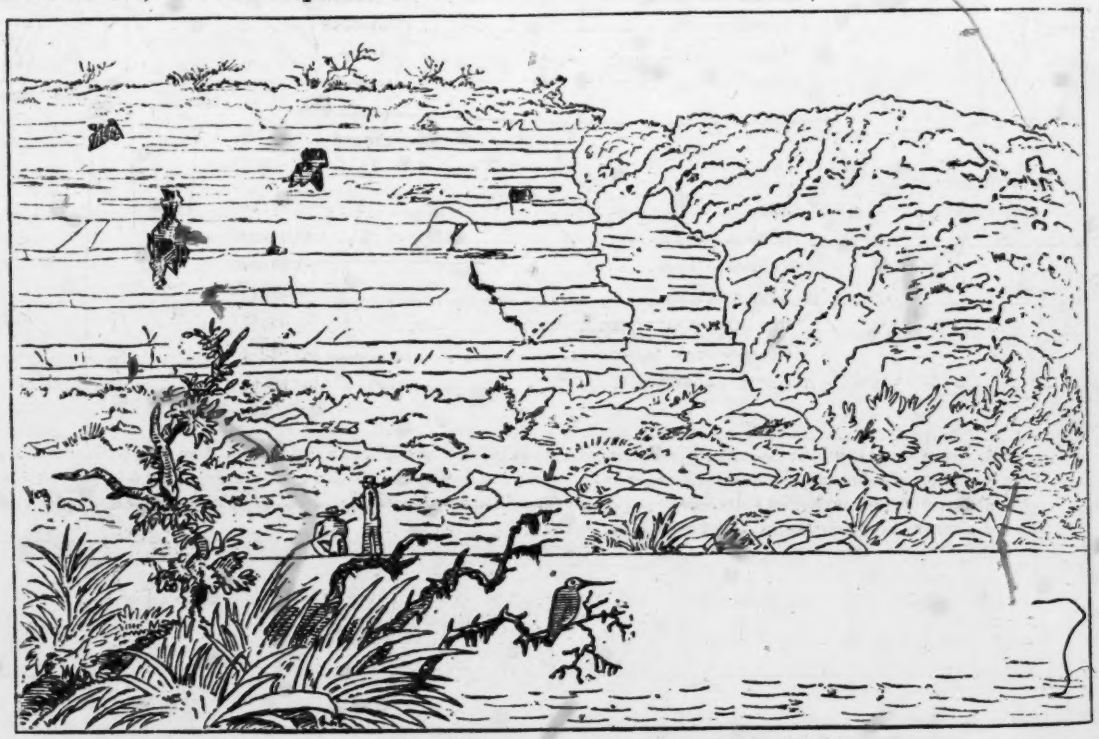
CHAPTER II.

SUBSTANCE OF THE SKETCH OF THE GEOLOGY OF THE LOWER RIO BRAVO DEL NORTE.

[By Arthur Schott, Assistant Surveyor, U. S. B. C., &c.]

SIR: In compliance with your instruction, I have the honor to submit to you the following description of the geological features of the country adjoining the Rio Bravo del Norte, from the mouth of the Rio Puerco (Pecos) to the Gulf of Mexico.

For the whole extent of country thus designated, I shall use the geological term *cretaceous basin of the Rio Bravo*, to correspond to the upper basin, which may be properly characterized as the *carboniferous metamorphic limestone*.



Banks of the Rio Bravo del Norte, 2-3 miles above the mouth of the Rio San Pedro, (Texas.)

Commencing at the point where the Pecos empties its muddy waters into the Rio Bravo, we find for a distance of about 50 miles a high table-land, consisting of solid masses of hard, dark-

gray limestone. This formation, viewed in its lithologic character, may be considered as carboniferous; yet the frequent occurrence of fossil remains within its limits hardly admits of its separation from the cretaceous system.

The outside of this limestone is, as already stated, of a dark ash color, often rough, presenting the appearance that a violently boiling mud-pool would after being upheaved and suddenly cooled. Its inside is often white or pale yellow, and mealy, with a great tendency to disintegration, which causes a great many holes, fissures, and excavations of every shape and description. These give this limestone a peculiar appearance, and one that is remarked by every traveller.

VALLEYS.

The small, as also the larger, valleys are mostly formed by the continued washing out of the dells and fissures. Thus formed by denudation throughout the whole country, with their borders cracked in every direction, they deserve only the name of deeply cut ravines, (cañons.) This cracked peculiarity may be ascribed to the combined influence of a high temperature, to which this formation may have been at some time exposed, and a subsequent more or less gradual refrigeration. There is scarcely a doubt but that all these table-lands were also formed under the sea, and at the same time exposed to volcanic action. If so, this limestone really deserves the name *metamorphic*, and its somewhat anomalous appearance would be accounted for.

It is our opinion that the limestone of the region above referred to is not of the same character throughout; it is not uniform, and appears under the most variable shapes. It may be seen in various localities, alternating with strata that bear the most striking resemblance to *magnesian limestone.*

STRATIFICATION.

The strata of this formation are generally arranged horizontally; sometimes, however, local disturbances appear which placed them into synclinal or anticlinal positions. The lower strata, often being of less solidity than the upper, and readily disintegrating under atmospheric agencies, are finally washed out into excavations by the action of water. These excavations occur commonly in the beds of ravines, and also in the banks of the river as considerable caves. They are also to be seen near the top of the table-lands and hill-ranges, lying as so many terraces, one above the other; the more solid layers, resisting the action of external agencies, project far beyond the softer.

High table-lands, intersected with deep vertically walled valleys, characterize the face of the whole country. The walls of these valleys, or more properly speaking, cañons, are variously cracked open, and presenting ravines of greater or less extent in all directions.

Those valleys seem to have relation only to the lithologic character of the formation. They are, therefore, usually short, and do not terminate in gradually diminishing fissures, like the heads of rivers and creeks, but suddenly end with a deep chasm under a vertical wall of rock. Deep holes are washed out under these masses of rock, where rain water collects and remains for a considerable time.

WATER HOLES.

Excavations similar to those here mentioned, and retaining water for some time, occur also in the usually dry beds of the tributaries of the Rio Bravo. This is in most cases the only water

that can be procured throughout the arid regions bordering the upper portion of the cretaceous basin of the river. Whilst the running water in these dry beds can find its way only by a subterranean passage through the holes and fissures presented by this formation, pools and small ponds of 150 to 200 feet in length and breadth occur in the cavities formed in the solid masses of rock. The valleys of the rivers Bravo, San Pedro or Devil's river, and Pecos, resemble each other in this respect.

BOTTOM-LAND.

Soil suitable for cultivation is scarcely seen in these river bottoms. When small slips of it appear, it is confined to places where a projecting rock or a deposit of mud and drift-wood offers some protection against the violence of the currents everywhere present in these rivers.

Such patches of bottom-land offer the only shelter and home for the growth of trees, consisting almost exclusively of live oak, hackberry, pecan tree, ash, and some two or three species of rhus. The country embraced by this formation is a waterless region, with a barren and rugged surface. There is but one constantly running tributary of the Rio Bravo between the mouths of the Pecos and San Pedro, a distance of 40 miles. The waters of this tributary, of a blue crystal-like transparency, boil out in a deep chasm from beneath a solid mass of limestone, and pour a rapid and full current into the river, but a few paces distant, through dark green shades of flowery and fragrant thickets that line its bed. Its solitary beauty, amid the barrenness and unbroken silence of the surrounding wilderness, suggested a fairy creation, and suggested the name of "Fairy Spring" to this enchanting stream.

Other ravines or "*rock creeks*" afford at times a small stream of clear running water. In their rocky beds occur here and there a series of water holes and small ponds, either isolated or connected only by a trickling run of water. There are several creeks of this character, especially in the vicinity of the Pecos, among which may be mentioned Painted Gallery, Nine-tailed Cat, Oak creek, and Fox-hole.

ANTEDILUVIAL DUNES.

Groups of hills and low ridges, from 80 to 100 feet in absolute height, appear in different localities on the table land of this region. Fossil remains are found on their slopes, and show that they also belong to the cretaceous formation, and constitute its last link. These hills may be considered as accumulations of cretaceous debris, preceding tertiary strata. The irregularity of the line of their direction, and their unmistakeable parallelism with the water-courses, lead to the conclusion that they really once bordered the submarine currents of a vast cretaceous sea, of which the section of country towards the mouth forms a part. Thus we are able to trace these antediluvial *dunes* on both sides of the river, and all its tributaries, not only in its upper part, but even as far down as the point where the cretaceous ridges come into view.

The Rio San Pedro forms a kind of geological boundary, and seems to have some close relation to other physical peculiarities of the adjoining region. Some changes are here perceptible in the fauna, flora, and meteorology; to speak of which, however, is foreign to the matter in hand.

UPPER METAMORPHIC LIMESTONE.

The limestone below the mouth of the San Pedro or Devil's river does not form such solid masses as that above. The high table-lands, already described, change into a more rolling,

sometimes broken, country. The rocky portions are only exposed along the valleys and water-courses, whose perpendicular walls, now thrown down, appear only as sloping banks. The lithologic nature of the rock becomes more earthy; its fracture, sharper. It, however, frequently presents a rounded and blunt surface, particularly where there is a tendency to disintegration. The limestone embraced in the section of country lying between the mouths of the rivers San Pedro and Las Moras, like that above, seems to be *metamorphic;* it, however, differs from the limestone above the river San Pedro, in indications of having been subjected to the action of a higher temperature; and its cretaceous character is also proved by the occurrence of fossil remains, which form in some respects a transition from the adjacent geological zone. The surface of this geological belt is completely covered with drift and alluvial soil; and the growth of trees (consisting almost exclusively of mezquite) appears more liberally distributed. Whilst there are scarcely any trees to be seen upon the prominent points, the dells, basins, or flat valleys, where rain-water washes together and deposits the more fertile portion of the soil, are usually invested with scattered groves of the leguminous trees.

HOW WATERED.

The surface of this region is usually dry; it is, however, well watered, when compared to the country adjacent.

The road from San Antonio to El Paso del Norte crosses in this belt (about 40 miles wide) six clear and bold running streams, of which Las Moras, Piedras Pintas, Zoquete, and San Felipe are the most characteristic. They are somewhat similar in general appearance, and in all probability have their origin on a more solid but in a greatly deeper situated stratum; for they pour forth at once their crystal waters either from deep funnel-shaped basins or from rocky clefts. Several of these springs indicate a higher temperature than the water in the streams below.

The water of all these little streams, as also that of the Rio San Pedro or Devil's river, is strongly impregnated with carbonate of lime. Everything hanging within its touch, or in any way exposed to its action, becomes perfectly coated over by its calcareous deposite in a remarkably short time.

In consequence of the permanence and abundance of running water in these tributaries of the Rio Bravo, their bottom-land will in time be highly valued for agricultural purposes. It would be an easy matter to irrigate it, as the fall of water almost throughout is very considerable.

INTERSPERSED STRATA.

The groups of hills mentioned before as placed upon the table-lands of the country between Devil's river and the Pecos, appear again in this belt as belonging not only to the later strata of the cretaceous system, but also apparently to a still later date. These strata are usually met with, bordering and constituting the edges of the different valleys. The fossils occurring in these localities are also of the age just mentioned. As an essential characteristic, we cite here strata and shoals consisting almost solely of entire and fragmentary pieces of *Exogyra*, *Arietina*, (Roemer.) They appear either in a state of perfect preservation, or as a real breccia; the cement of which is mostly an ochre-colored calcareous sand or clay.

The stratification of this formation shows a succession of layers of variously tinted marls, of more or less coarsely grained sand, and also of differently colored limestone; all are profusely

impregnated and sprinkled over with oxide of magnetic iron. Some of these strata contain pieces of the latter formed into every shape, but most commonly give to the matrix the real habitus of volitic texture.

This imbedded formation increases as you approach its lower edge, (Las Moras,) leading to another change in the lithological features of the country along the Rio Bravo.

Before considering this change, however, another fact of much geological importance is not to be overlooked.

THE DYKE.

About twenty miles below Las Moras is Elm creek, (Arroyo de Los Olmos,) the next tributary of the Rio Bravo on the Texan side. Its valley belongs to still another geological belt; none of the more solid metamorphic limestones before referred to are now to be seen. The whole country from Las Moras to the mouth of the Rio San Juan, and even as far down as the vicinity of the Mexican town of Reynosa, forms another link of the cretaceous system; a more soft and brittle sandstone, (partly chloritic?) varying in grain, color, and cohesion, constitutes the main part of this formation. This resembles very much, if it is not in reality, the green sandstone or chloritic chalk itself.

Its northern limit, where it joins the more recent metamorphic limestone some distance below the Las Moras, is distinctly marked by a line which shows on the surface or in the soil signs of a geological disturbance. This limit is the valley of Elm creek, two miles and a half above Eagle Pass. It is wide and flat; the ridges of hills bordering it are often overthrown and washed down, whilst the horizontal strata in many places are brought into synclinal or anticlinal positions. The creek itself, not the one of that name on the El Paso road, is sluggish, and carries only a dirty, greenish, and brackish water, which often disappears in its bed, leaving only here and there small ponds and muddy pools. Out-crop of pretty extensive beds of lignite coal occur on both sides of the mouth of this creek well worthy of examination, and may prove to be of commercial value.

These coal-layers probably gave the name "Piedras Negras" to the Mexican military colony in the vicinity. The aspect of the valley of Elm creek, and the character of the country to the right and left of the Rio Bravo at this point, justify the idea that a subterraneous volcanic dike crosses the basin of the Rio Bravo. By turning for a moment from our course along the Rio Bravo, and proceeding from the mouth of Elm creek in a direction southwest by south for about seventy miles, we reach the foot of a high and bold mountain range formed of metalliferous limestone, (*zechstein*,) the precious contents of which once made Santa Rosa famous as a silver-mining town.

On the line between the Rio Bravo and the Santa Rosa mountains, the face of the country shows many signs of a geological disturbance; the usually undulating region becomes more broken, whilst the flat, long-stretching ranges of hills are frequently overthrown. The slope of the Santa Rosa mountain is rocky, wildly broken, and steep, and large portions of the strata are entirely dislodged and most anomalously placed. The stratification here is not only seldom horizontal, but frequently thrown up vertically. There is some regularity, however, in this apparent disorder, particularly with respect to the parallelism—the characteristic of all the cordilleras of the American continent.

PARALLELISM AND VOLCANIC CROSS AXES OF THE MEXICAN CORDILLERAS.

By this parallelism is meant an inclination of the chief sierras to separate into collateral sub-sierras and side branches, which again join the main chain; or they are at least connected either by cross sierras, or even simple dykes. To this striking peculiarity the profiles of both the northern and southern portions of the western hemisphere are due. This mountain range of Santa Rosa presents another characteristic, and one, according to Alexander von Humboldt, peculiar to the mountain system of Mexico—it is, that the volcanic axes cross the direction of the Cordilleras almost always at right angles. There are many cross-valleys on the northeastern slope, proving the action of some volcanic disturbance; a valley some eight or nine miles east of Santa Rosa, called "El Potrero," is the most remarkable instance. Several mines are still worked here, where the metalliferous limestone is variously traversed by veins of feldspar and limestone spar; this latter usually accompanies the silver ore and galena. In the centre of this *cul de sac*, a better name for this so-called valley, can be seen an ancient crater, the inner walls of which are thickly coated over with a lava-like basalt of a dark red hue, whose composition differs apparently but little from that which covers in layers (20 or 30 feet thick) the cretaceous range of hills joining the northeastern slope of the metalliferous mountains.

It may, perhaps, be of importance to state that the argentiferous portion of the Sierra de Santa Rosa is not more than ten or eleven miles in length, commencing at a point called "El Cederal," (the Cedars, Cedar Grove,) and terminating at a place, in a northwest direction, bearing the name of "Los Nogales," (the Walnuts, Walnut Grove.) The presence of ores, together with the trap or basaltic dykes branching out from the sierra at right angles, may prove the supposition which places here the origin of the volcanic power, that, pushing through the fissures of stratified rocks, causes the dyke before alluded to. Following this dyke from Santa Rosa up towards the Rio Bravo, it will be found to cross the valley of this river in the vicinity of Elm creek, as already stated.

BASALTIC HILLS—VOLCANIC DYKES IN TEXAS.

On the Texan side, the first marks of volcanic action are to be seen at the head of Leona river. Here a solitary hill of 60 to 70 feet in height occurs, formed entirely of a dark green basalt which is closely allied to that of the Santa Rosa mountains, and which also contains much *hornblende* and *olivine*. In the vicinity of Fort Inge, and also near the head of Las Moras, are several hills of the same nature; also the road from Leona to the first crossing of Devil's river leads over several places indicating volcanic action.

The west bank of the Rio Frio, at the crossing, is formed of a solid mass of basaltic rock, which undoubtedly belongs to the dyke alluded to as having its origin in the Santa Rosa mountain, and here crossing the cretaceous formation.

DR. ROEMER'S VIEWS.

Dr. Roemer, in his not yet translated work, entitled "Die Kreidebildungvon Texas," ("The Cretaceous Formation of Texas,") mentions (page 8) that plutonic or volcanic rocks were brought to him from between the San Saba and Cibolo; and according to him, granite, together with older stratified rock, is seen in narrow strips, surrounded with cretaceous strata, between the

San Saba and Pedernales. Again, about fifteen miles due north of Fredericksburg isolated granitic rocks have been met with, among which is the "Enchanted rock," of popular renown.

Also, between the Llano and San Saba granite protrudes through cretaceous strata; and sixteen miles north of Fredericksburg occurs a coarse-grained granite, consisting of flesh-colored feldspar, gray quartz, and some little black mica.

In other places along the Llano very finely grained varieties of granite have been observed. Granite, frequently interspersed with veins and fragments of a white quartz, also appears at various points. Pieces of syenite, too, have been found along several of the tributaries of the Llano.

Besides these plutonic forms, trap-like rocks also seem to occur in many places of the country referred to by Dr. Roemer. Again, this author received from twenty miles to the northeast of San Antonio de Bexar pieces of a black basaltic rock, which protrudes in veins through the cretaceous limestone strata. In this basalt, as component parts, are many minute crystals of a white fossil, (glassy feldspar?) and also a dark, olivinish fossil.

The geographical distribution of the rocks of which Dr. Roemer speaks permits only the conclusion that all the marks of plutonic or volcanic formation must belong to the same system, which, traversing the upper limit of the more recent cretaceous strata in the valley of the Rio Bravo, shows itself in the shape of the low basaltic hills mentioned as occurring at the crossing of the Rio Frio, and at the heads of the rivers Leona and Las Moras.

There is no doubt that this dyke continues its northeastern direction, accompanying as an outlayer of the higher regions of the Guadalupe and Ozark mountains, and thus probably crosses the whole of Texas, and possibly Arkansas.

METEORIC IRON.

With regard to meteoric iron, to which Dr. Roemer refers in connexion with the plutonic rocks, and of which he mentions a large specimen now preserved in Yale College, we have to state that, besides magnetic iron ore, which is scattered in loose innumerable pieces of every shape and size over the whole surface of the cretaceous basin of the Rio Bravo, meteoric iron is known to exist about ninety miles northwest of Santa Rosa. An American resident of this town, Dr. John Long, called my attention to a piece weighing some twenty-five pounds, which was then in the possession of a Mexican; small pieces had been cut from it, and hammered out without the aid of fire into some trifling articles. It is said that the whole surface of the area (embracing about thirty acres of land) where the deposition of this valuable mineral occurs is covered with blocks of it, of greater or less extent, some containing as much, and even more, than thirty-six cubic feet.

GREEN SAND WITH LIGNITE.

The upper limits of that portion of the cretaceous basin, which consists chiefly of strata of green sand, and the course of the volcanic dyke discussed above, seem rather to run parallel than approach each other.

So far as our observations extended, the main portion of the cretaceous basin, from Las Moras to the vicinity of Reynosa, forms a belt of 380 to 400 miles in width.

The upper part of this belt commences in the vicinity of Las Moras, and terminates some few miles above Laredo, a distance of about 200 miles, whilst the lower part begins where the former ends, and reaches as far as the vicinity of Reynosa, showing a width of about 340 miles. Both of these parts are distinctly characterized by strata of green sand, (chloritic chalk,) which change, according to the amount of oxyde of iron they contain, into variously tinted sandstone shoals. The solidity of the strata varies very much. They are sometimes formed into very solid rocks, well suited for mechanical or architectural operations; again, they consist of loose and coarsely-grained sandstone slate, which rapidly crumbles on exposure to the air. All these green sand strata are frequently intersected with layers of debris of analogous character.

In several places where these green sand strata were disintegrating, and being carried off by the action of the waters, there was observed a white, salty efflorescence, which may possibly be "ammonia." The "Rocky walls" near the mouth of the Arroyo Castaño, which is about 40 miles below Eagle Pass, and near the Presidio de San Juan el Bautista, are remarkable for this efflorescence, as also some terraces below this point. The frequent occurrence of a certain chenopodium, containing a large amount of this salt, and often covering exclusively wide tracts of sandy bottom-land along the Rio Bravo, may prove more conclusively the peculiar elements of the green sandstone.

The green sand, particularly in the upper belt, is often and variously intersected by strata of different nature, though certainly closely allied with the same system.

Strata of sandy or argillaceous marls, or blue or grayish clay, all profusely impregnated with oxide of iron, and even layers of corresponding debris, often intersect the green sand strata.

The general characteristic of this belt and its subdivisions is the strict horizontality of its strata throughout. It is only here and there that some slight local disturbance has taken place, as, for instance, near Laredo, and again some 40 or 50 miles above, where a dip of about 8° W.S.E. and E. is exposed.

The following peculiarities may serve to characterize the two subdivisions of the green sand belt:

LIGNITE COAL.

From Las Moras to the vicinity of Arroyo Sombreretillo, which is about 10 miles above Laredo, lignite coal occurs quite frequently. None came under our observation below this point; outcrops of it, however, are said to be found in the neighborhood of Roma, some 10 miles above the mouth of the Rio San Juan.

Though there is not much doubt of the existence of lignite below the Arroyo Sombreretillo, our observations have led us to the conclusion that it is more sparsely distributed.

These lignites vary both in appearance and quality; sometimes they are found to be scaly or slaty, and of a dull earthy fracture, sometimes resinous and sharply edged. Prints, and even remains, of plants, preserved in these coals, indicate vegetable forms of the higher orders, as graminee, (perhaps reed and cane,) and even parts of dicotyledonous trees, such as willow or ash. Other specimens of coal from below appear more amorphous; but it contains so much bitumen as to be of no use in the blacksmith's forge, where it runs together and becomes baked into a solid mass.

The localities remarkable for the most considerable deposits of lignite coal are the following:

On both sides of the mouth of Elm creek, near Eagle Pass, particularly on the north bank of this water-course, where layers from 3 to 4 feet thick are exposed. On the south bank of this

creek, also, and quite near Eagle Pass, several conspicuous layers are seen. A blacksmith, once connected with the garrison at Fort Duncan, used this coal for some time in his shop; and having satisfactorily tested its value as an article of trade, went to mining it. There was a ready market at San Antonio; the cost of the labor, however, in getting it out, together with the great expense of transportation on account of the Indians, put an end to the mining operations of this enterprising individual.

Small seams of coal appear also on the Mexican side of the river, just below the mouth of the Escondido, which is two and a half miles below Eagle Pass.

The thickest layers of coal noticed, however, are on the slope of the Lizard hills, below the deserted rancho Palafox; a more bituminous coal occurs here in layers from 4 to 5 feet thick.

According to our experience, the finest and best of all the lignite coal in the valley of the Rio Bravo is that which occurs in the neighborhood of Arroyo Sombreretillo. This is apparently the most bituminous observed on the whole line.

Off from the river, near Santa Rosa, lignite coal was seen. Although its layers are thinner, and its quality inferior to the various deposits heretofore alluded to, yet its relation to and close connexion with them hardly admits of a doubt. The layers, generally horizontal, are here thrown up almost vertically; which position is the natural consequence of their being placed near the basaltic dyke frequently referred to before.

BITUMEN.

It is but proper to mention here the occurrence of another fossil, not less interesting and valuable than coal. This is a sort of fossil resin or bitumen, which was met with in loose scattered strings on the slope of "White Bluffs," about 20 miles below Eagle Pass. Some few and but small specimens (such as could be saved) were sent to Dr. John Torrey for examination, who found them to be similar to a substance which he had received some time previous from the province of New Brunswick, and examined in order to elucidate a law-suit there pending. Can it be that the occurrence of this fossil in these extreme cretaceous localities proves a close relationship between their respective strata?

BLUE OOLITE-LIKE LIMESTONE.

Other intermittent strata of the upper green sand belt may also be considered as characteristics. For instance, there appears frequently a blue coarsely-grained limestone of a decided oolitic texture, often showing a somewhat crystalline and sharp fracture. This is sometimes alternately intersected by and covered with an ochre-colored stratum, usually of a more sandy structure. Both of these rocks abound in fossil shells of a more recent cretaceous, if not of tertiary age. They cannot, for this reason, be pronounced as truly oolitic, however much their structure and appearance might justify such a supposition. Wherever this limestone occurs, it affords to the inhabitants the material for building their houses, and is also burnt in kilns for domestic use. May it possibly be identical with the "Calcaire grossoir" of the French? Some strata of this limestone show large masses of a compound, consisting either of magnetic iron combined with sand and marl, or clay, or an aggregation of the latter strongly impregnated with the former.

BLUE CLAY.

Besides this limestone, there are strata of a dark gray, sometimes blue, clay, which either cover or intersect the layers of green sand. This clay is often hard and rock-like, forming sometimes extensive reefs and banks, which seriously obstruct the navigation of the Rio Bravo. In other places, especially where it is under water, it is soft, and can be moulded between the fingers like plastic clay, to which it is closely allied, if not identical with it. The renowned rapids of the "Isletas," in the vicinity of the Mexican Presidio San Juan El Bautista, are formed by this clay. Above this place, some 10 miles, are similar clay deposits covered with shoals of oyster-breccia 2 feet thick, pieces of which were added to our collection of fossil specimens.

A clay similar to this usually accompanies the lignite coal that has been referred to above.

These are, then, the characteristics in which the upper portion of the green sand belt differs from the lower, where alternating strata of sandier compounds prevail, instead of the argillaceous, as in the former.

THE GREEN SAND WITH FOSSIL OYSTERS AND SHELLS.

As the frequent occurrence of lignite coal characterizes the upper belt of green sand, so the banks and shoals of fossil oysters indicate the lower.

These oysters, together with conglomerated shoals of shells, seem to be of an age still later than the fossils of the cretaceous period above; some, indeed, would seem to belong properly to the tertiary strata.

The lower portion of this green sand belt appears generally as if it were constituted a part of the eocene system.

The prints and remains of dicotyledonous and monocotyledonous leaves and plants in the lignite coal, with some fossil shells of later age, led to the conclusion that all such fossiliferous strata belong to the tertiary period, which, however, seem to have only a local distribution throughout.

In this belt tertiary deposits occur very generally, sometimes constituting extensive tracts of land.

The fossil oysters and shells before spoken of are of the largest size; and extensive banks of them are seen at several places along that part of the river embraced by the lower green sandstone belt. Of these, we may instance Roma, the Island Las Ajuntas, Shady Bluffs, near Mier, and a point some 25 to 30 miles above the mouth of the San Juan. Other similar fossils are often found at these places covered with a perfectly chalky-white coat.

Slate-like sandstone often intersects the green sand, and forms at a number of points massive walls of considerable extent; the adhesive quality of the particles of this rock, however, is often not very persistent. Its inside is very soft and readily crumbles, as is shown sometimes by the disintegration of the outer coat.

SEPTARIAE.

Another peculiarity of this lower belt is the frequent occurrence of a variety of septariae. The highest place in the valley where they were seen (probably only as drift) was between Elm creek and Las Moras. Further down the valley, however, they are more abundant, and just

below the mouth of Arroyo Sombreretillo they make their appearance quite frequently. Again below this point they are still more plentiful. On the oyster-terraces, some forty miles below Laredo and near the Rancho San Ignacio, there is a spot remarkable for the abundance of this fossil; as are also the following places: the slope of "Red Ridge," of "Shady Bluffs," and Septariae Hills. Their most common shape resembles very much a small, flat loaf of bread. Both on the out and inside large irregularly-shaped divisions, like cob-webs, are to be seen, which seem to have been formed by a net-work of veins composed perhaps of crystals of gypsum, which commonly abounds here. This fossil is in all probability to be referred to ludus helmontii, (turtle stones.)

The largest septariae of this kind was seen at Laredo, whither it was brought from the vicinity of the Arroyo Sombreretillo. The whole piece, 2 feet across and nearly 1 foot thick, consisted only of the cob-webbed part, showing cellular aggregations of a silicious matter; its color was pale yellow.

"The Bombshell Bluff," on the lower Rio Bravo del Norte, Texas.

Fragments of similar septariae, if these latter deserve that name, were also found in several other localities below Laredo. Other aggregations, septariae-like in character, are seen as balls or nodules of various sizes, composed of a pale green sand imbedded in a similar but more brittle marly matrix. Clusters of such balls abound under some green sand bluffs near Rancho Clareño; from the size of a three-pound cannon shot up to that of the largest bombshell—sometimes entire, sometimes cracked in two. So striking and peculiar are these rocks, as to be justly entitled to the name of "Bombshell Bluff," with which they were christened.

FOSSIL BONE.

The lower portion of the green sand belt reaches as far down as the vicinity of Reynosa, which is about 200 miles from the Gulf. Here the last cretaceous ridge of hills approaches the valley of the Rio Bravo, though no rocks are exposed on its banks.

Tertiary strata seem, however, to occur alternately throughout the whole country. Many bluffs and ridges may be referred to this formation; for a fossil bone was taken out of a bluff near Camargo, on the Rio San Juan, and was in the possession of a resident of Eagle Pass, who stated that many such interesting remains of fossil fauna were to be found in the same and similar localities.

FOSSIL WOOD.

As to the presence of tertiary strata in the valley of the Rio Bravo, it would be proper to add here another suggestion based upon the frequent occurrence of fossil wood; by a close examination of which. some three or four genera or species might be classified.

The mouth of Elm creek is particularly distinguished for the abundance of fossil wood, which is usually found here scattered about as if brought down from some higher localities; yet pieces of trunk and branch sometimes were so arranged as to lead one to suppose that they once belonged to a tree on the spot, which had just fallen to the ground. Not far from this place, and very near the layers of lignite coal before spoken of as lying adjacent to Eagle Pass, the trunk of a fossil tree was discovered in one of the innumerable ravines cutting the borders of the Rio Bravo valley, 2½ feet in length by 15 inches in diameter. The largest pieces of fossil wood, however, were noticed in the environs of Santa Rosa; it abounds especially at the foot of the table-land ridges, running out in a northerly direction from the main ridge of the argentiferous mountains. These flat ridges, called by the inhabitants "Las Mesas" or "Lomas," belong to the cretaceous system, and are covered with strata, from 20 to 30 feet thick, of basaltic rock and trap or basaltic tuff.

So far as could be seen with the naked eye, there is not much difference between the texture of this fossil wood and of that near Eagle Pass and at other places along the valley of the Rio Bravo. Most of this fossil wood possesses apparently the structure of the palm-wood. The color of the specimens from Santa Rosa, however, is quite different from the rest. They show a dark reddish brown, much like the basalt in their neighborhood, placed on the top of the mesas. It seems highly probable that this wood may have been at some time in contact with these igneous and eruptive rocks, and that this red brown color was imparted to it by a certain proportion of oxide of iron.

The larger pieces of this fossil wood have been carried to town to serve as corner-stones. Some of these measured from 3 to 3½ feet in length by from 12 to 18 inches in diameter. The large size of the Santa Rosa specimens, compared with those found in the valley of the Rio Bravo and the surrounding country, led us to conclude that the former were not brought from so great a distance as the latter; in fact the former could not have originated far off, because the tertiary strata, which are undoubtedly their home, cannot be sought for on the top of the Santa Rosa mountains, bordering as these do the cretaceous basin of the Rio Bravo.

Whether all the fossil woods of the various localities mentioned are endogenous or not, we are

not prepared to state; though we think it is possible that some of it may be correctly referred to the coniferae.

This fossil wood belongs to both of the subdivisions of the green sand belt, and may be ascribed to them as a geological characteristic; it occurs more frequently, however, in the upper portion. It is not only to be found in low places, in the bottom, and on the borders of valleys, but also in the midst of the elevated and vast prairies that stretch from one water-course to another. It here lies scattered broadcast among the pebbles of the diluvial drift that covers all the plains and slopes.

PHYSICAL FEATURES OF THE COUNTRY.

The section of country embraced by the green sand belt, though somewhat similar in its outlines to the table-lands of the cretaceous limestone above, presents a more gently undulating surface. Although the upper side of this belt shows the horizontal stratification of the cretaceous system, yet, being interspersed with ranges of hills and ridges of a later age, (and even of tertiary origin,) the land as a consequence becomes more rolling. The substrata of limestone which constitute the beds of the clear water streams between Las Moras and San Felipe being placed much deeper in the lower country, and probably out of contact with the subterranean strata of metamorphic rocks belonging to the volcanic dyke of the country, may account for the general dryness of the green sand region; for this seems to be entirely deprived of running streams, as elsewhere stated.

The dry water-courses, sometimes cut from 50 to 80 feet deep, show only at distant intervals pools or ponds. These reservoirs contain a dirty, green, brackish water, on which man with the wild and domestic animals alike have to depend. This water benefits but little the surrounding soil, which affords at most only a scant vegetation. Narrow and limited strips only, bordering on the immediate edges of these ponds, flourish with the vegetation of a well watered soil. These water-holes, though, bad as they are, are real oases in this desert region, and afford the only meeting places of animal life; here, the white man, a traveller, and for the most part peaceable in his pursuits, the Indian, more or less hostile to civilization and humanity, and the herd-driving, half-breed Mexican, seek this indispensable gift of nature.

Such places are easily recognized, even at a considerable distance, by the presence of numerous and various flocks of birds, and a nearer approach shows them to be marked with a denser growth of trees, shrubs, and weeds. They constitute a distinct characteristic of these regions.

Between the densely covered borders of these watering places and the bare slopes and arid heights, dells, basins, and all other varied depressions, almost always exhibit a more luxuriant state of vegetable life. This condition may be explained in part by the increased hygrometric capacity of the atmosphere, however little moisture may be deposited. Here, also, the rain-water sweeps together the more fertile particles of the soil, which, possessing a great deal of moisture, comparatively, causes vegetation to spring forth. In this same belt of country, on the Mexican side of the river, there are more running streams than on the Texan side; and for the reason that the conditions on which their origin and existence depend, are less distant, as will be made evident from what follows.

Sierras or mountain ranges, formed of igneous and metamorphic stratified and unstratified rocks border, on the Mexican side, the cretaceous basin of the Rio Bravo. To these that side of the river is indebted for running water in the shape of several large, clear-water streams. Where there is hardly one running stream on the Texan side, on the Mexican are six, which carry no inconsiderable quantity of water in the Rio Bravo.

Besides the small streams, very changeable in their supply of water, the following are remarkable for their constant flow:

Escondido, near the head of which is situated the town of San Fernando, has its mouth about three miles below Eagle Pass.

Las Cavezeras, heading in the immediate vicinity of the Escondido, with the little town of San Juan de Allende and Nava near its source, empties some thirty miles above the destroyed rancho Palafox.

The Salado, carrying what may be considered here a large body of water, which is supplied by several large branches from near Santa Rosa, (Sabine, Alamo, and others,) commingles its waters with the Rio Bravo some eight miles below Guerrero, and nearly opposite Redmond's rancho.

Alamo, having its source in, and bringing its waters down from, a more southern portion of the Mexican Sierra, falls into the Rio Bravo near Mier.

The San Juan, gathering its waters in still more southern portions of the Sierras which form the highlands of the States of Coahuila and Nueva Leon, empties just below Camargo.

There is almost no running water on the Texan side from the beginning of the green sand belt down to the mouth of the Rio Bravo, if we except some few sluggish, half-underground, trickling creeks. If it were not, however, for their subterranean course, which prevents entire evaporation, this region would be wholly destitute of water.

The state of water near the mouth of these creeks is always affected by the rise or fall of the river, and also by the hygrometric precipitation of the atmosphere, however small quantities this latter may contribute.

These peculiar water-courses form a characteristic feature of the country through which they run; and their thorough knowledge gives advantages to the natives, by which they elude the pursuit of the white man, and render his efforts of no avail.

THE ISLANDS.

Another peculiarity of the portion of the Rio Bravo that winds through these cretaceous regions is the frequent occurrence of islands, various in size and appearance.

Whilst in the upper part of this cretaceous main the size of the islands is reduced to that of mere bars and reefs, (bare, or covered with rush and cane,) further below their absolute height above the water increases, and consequently the number of vegetable forms growing upon them.

As nearly all the islands are formed by alluvial deposits on stratified rocks, the layers of which they are composed assume or are arranged in a strictly horizontal position. As a matter of course, therefore, the down-river end usually rises high above the water, while the up-river end always appears partially covered with muddy and gravelly deposits and driftwood and the like that the river is continually carrying down.

Above, the islands are only mere banks or mud-bars, brought in by the tributaries and deposited according to the action of the currents of the river. Where the current is rapid and the course of the tributary is short, as is the case between the Las Moras and San Pedro, islands are not formed in the middle of the river; here they occur only as long narrow stripes of half immersed bars and banks below or above the mouth of the tributary that causes them. Sometimes the force of the river keeps back the deposit, and causes the formation of the island within the mouth of the tributary; such a case is presented at the mouth of the Arroyo "Piedras Pintas."

Where the water is sluggish in the river and a strong current in the tributary, the islands are pushed further out from the mouth of the latter.

Islands, rising to the height of the alluvial banks of the river, 20 to 30 feet above the water, do not occur above Eagle Pass.

Cazneau's Island, named in honor of an American gentleman who resided in this vicinity for several years and cultivated it to some extent, is the first that is situated above the common high-water marks Such, however, are rare between Eagle Pass and Laredo, and it is not until reaching a point some ten miles above the latter place that another island occurs which would be worthy of consideration for agricultural purposes.

Below Laredo, the first island of this kind is "Isla de los Rancheros." With this commences a series of about twelve, which the Mexicans cultivate, raising corn, tobacco, melons, pumpkins, and other produce for domestic use.

To facilitate the identification of these islands, the following names were given to them in the topography of the survey: Mustang Island, Belvidere, Maj. Brown Island, Carriso, Melon, Green Tassel, Patriarch, Cypress, Island of Last Rocks, Isla Los Ajuntas, Beaver, Sabine, and Green Key; the latter one being only a narrow flat strip, subject to inundations, ought rather to be classified with the islands of the upper region.

Among the islands here mentioned, Los Ajuntas, near Mier, is, in consequence of its size and fertility, the most valuable. It is also the largest one of all, being 2¼ miles in length by almost ¾ of a mile wide; its upper part is heavily timbered, whilst its lower is open, and constantly under cultivation.

At the mouth of the Salado, and thence downward, the shore and banks of the Rio Bravo are of a softer character; the former is more muddy and sometimes miry, while the latter, disintegrating and washing down, lay the foundation for, and causes an increased growth of, vegetation. The soft soil, with the luxuriant undergrowth, added much to the labors of our surveying party.

At the Island of the Last Rocks, shoals and reefs, obstructing the navigation, make their appearance for the last time in the bed of the river, though rocks are still seen on both sides along the shore. If rocks do appear in the bed of the river further down, no danger is to be apprehended from them because of their depth below the surface.

The lower part of the green sand belt undergoes still another change in its external appearance; this is quite perceptible at the mouth of the Rio Salado, and downwards continuously from that point. The frequent occurrence of oyster banks and shoals, together with the external appearance of the strata, seem to verify the inference that the regions here and below are of a still later age than the green sandstone belt.

The Rio Alamo seems also to indicate a distinct line in the geological features of the country.

Besides the presence of extensive fossil oyster-banks in its vicinity, there is below its mouth, on the Mexican side, a most rugged and naked spot, which presents the appearance of having just been torn to pieces by some destructive freak of nature. The scene of this apparent catastrophe now constitutes a wide flat basin, which is arid and literally cut up in every direction by ravines and rills. On the borders of these ravines, which run to a common centre and form a pool of water known as the "Sulphur Spring," are to be found a sulphur-colored earth, probably alumn and sulphur. The mineral water of this spring just now under examination, tastes strongly of sulphurated hydrogen gas, and after standing for some hours in a vessel, collects a black deposit on the bottom. This water is celebrated in the country around for its medicinal properties. When the American army was camped near here during the Mexican war, it was much used on the recommendation of the surgeons.

Here, within a distance of about 2½ miles, several water-courses empty into the Rio Bravo, and form by their deposits a large island, which, as a result of this united action, was named "Los Ajuntas;" besides the Alamo, already mentioned, these tributaries are the Sulphur Spring, the Saladito, and Arroyo Hondo.

THE FLORA.

The flora of both the green sand belts show, as to the number of genera and species, various additions, and a more luxuriant development when compared with the vegetable life of the regions above.

As instances, the Huisache and Guaxillo, and other plants, all of the Mimosa family, growing above only as arborescents, gradually rise in these belts, and further down in the valley, to the size of conspicuous trees, often forming dense copses in the old beds and on the banks of the river. Of the several genera added, especially noticeable, are the Coma tree, the Nacavites, the Anacua, and Sabina; the latter two seem to have been brought in by the Rio Salado.

The appearance of the Cypress (Taxodium) Sabina of the Mexicans makes quite a striking change in the physiognomy of the country. This water and rock-loving tree often appears right in the middle of the swiftest currents of the river, where having taken hold of some rocks on the bottom, it boldly defies the force and action of the water. These cypresses on the Rio Bravo, commencing at the mouth of the Salado, extend as far down as Beaver Islands, just below Roma, where they make their last appearance in the channel on the Mexican side, footing in water from 14 to 15 feet in depth.

THE COLLUVIAL BELT.

After passing the lower green sand belt, (geographically speaking,) which has its lowest limits in the vicinity of Reynosa, as already stated, the colluvial commences and extends down to the coast. Under the term "colluvial" we include both the diluvial and alluvial deposits; these are irregularly and somewhat alternately arranged—the result of the oscillatory action of the salt waters from the sea-side, and the antagonistic and downward force of the fresh waters.

It is on account of this irregular distribution that the colluvial belt cannot be properly subdivided into a diluvial and an alluvial portion. Topography and, in some degree, botany, may, however, aid in examining, in its subdivisions, this lowest belt of the cretaceous basin of the Rio Bravo.

From Reynosa to the Rancho Lomita, 18 miles above the mouth of the river, the surface of the country is of a gently undulating character, which is accounted for in the fact that the colluvial deposits rest upon underlying cretaceous strata, which become deeper and deeper as the coast is approached. The river is now more serpentine in its course, and at almost every one of its numerous bends may be seen a lagoon, pond, or pool, in which thousands of water-fowl collect and feed. There is little or no tendency in the river to form islands towards its mouth, where it becomes narrower; its bed, however, is always undergoing constant and rapid changes. No bend, under the capricious action of eddies and whirlpools, retains its form for more than a season.

We noticed at several points, where a new bed had been formed a short time before, that there was scarcely any perceptible difference in the strength of the two channels, the river taking its course through both with equal force and volume. The boatmen not unfrequently found themselves in a sort of "steering dilemma" at such places, not knowing which was the channel. The outlet of the old bed, or its junction with the new, presented quite another aspect, and certainly not inviting entrance to those who come *up*.

It is in this region that the vegetation of the Rio Bravo displays its highest and most luxuriant development.

All the bottom-land, not under cultivation and not subject to the action of the water, is covered with dense thickets, almost wholly impenetrable, composed, as they are, of lofty trees as well as of smaller undergrowth, and of a great variety of creepers and vines, springing up from every spot not otherwise occupied, and filling up all the open and shady spaces, from the foot to the topmost branch of every tree and bush. It is also in the lower portion of this belt (where the Palm tribe is represented by the Chamaerops Palmetto) that the Palmetto attains a growth as gorgeous even as that on the Lower Mississippi; it extends on the Rio Bravo up to about 80 miles from the Gulf. In addition to the Palmetto common to the lower portions of these two great rivers, the constant appearance of a Tillandsia (Spanish moss) depending from the branches of the trees in long clusters increases the similarity of their scenery. Whilst the existence of this moss proves a higher degree of atmospheric moisture here than in the country above, the occurrence of the Palmetto may indicate the vicinity of the sea.

There would, perhaps, be no mistake in placing the limits of the maritime belt where the growth of the Palmetto ceases, particularly if we take into consideration the fact that several salt-water loving plants keep company with this representative of the Palms. The real coast belt, however, in the true sense of the word, may be placed with more propriety in the vicinity of the Rancho Lomita, 18 miles above the mouth of the river.

THE COAST.

Lomita, the diminutive of Loma, a long, somewhat flat hill or ridge, forms one of the last topographical monuments on the Rio Bravo. These consist of a low ridge of calcareous clay, bare and almost entirely deprived of any vegetation whatever. The ridge on which the town of Lomita is situated, like several others below, shows marks of being continually under the destructive action of the tide of the sea and flood of the river which meet here.

From Lomita down the land shows the real character of the seacoast, the vegetation decreasing gradually towards the mouth of the river. Most of the trees here yield the field almost solely

to some few members of the Mimosa family, of which latter the Huisache maintains its place nearly down to the tidal sand-banks of the gulf.

Lagoons, old river beds, ponds, swamps, pools, bayous, and other similar phenomena now constitute the lowest belt. Here the deceptive mirage constantly bounds the distant horizon, and the scenery, under its influence, presents to the mind but a chaotic dream still hovering over the land—a twilight gift of creation.

Besides the regularly occurring ebb and flow of the tide, which was observed at Rancho Lomita varying from about four to six inches, the fauna of the water indicate that the maritime belt has its upper limits in this vicinity. Some little distance below Lomita a two-valved shell and a decapoda, the camaron of the Mexicans, announce the proximity of the sea. Both of these animal forms seem to go up as high through the alluvial deposit as the tide affects the river.

ALLUVIAL DEVELOPMENT.

There is another portion of this lowest and most recent formation which, still under the continual action of both salt and fresh water, might be considered only as a rudimentary development of the alluvial belt along the coast. Not having yet risen above the level of the water, it is called, in the language of the sailors and pilots, the "bar." Such a place affords a home only for the various marine crustaceæ, and the meeting ground of the sea-fowls, the wreckers of the population of the air.

In regard to the topographical features of the coast, it may be completely characterized by the statement that it consists partly of the fragments of the solid parts of marine animals, partly of entire or decomposed vegetable forms, partly of deposits of inorganic matter, and partly also of fragments of animals, vegetable matter, and other material brought down by the river. Washed off and brought back again by the varied motions of the waves—sometimes united, sometimes antagonistic—as a matter of course this adjunct of the colluvial belt is always undergoing a change. This is, however, strictly regulated by the varying amount of power exercised on the one hand by the irresistible waves, and on the other hand at times by the no less forcible flood of fresh water. Agents of the sea are atmospheric currents and ebb and flow of tide; antagonistic to these oscillatory movements are the forces of the river, influenced by the hygrometric conditions of the air and the hyetographic state of the seasons in the country above and along the river.

The bar, though a mere toy under the action of the forces just mentioned, is not to be overlooked, for it is a constantly increasing piece of land not yet left by the working hand of creating nature, and therefore a matter for observation of much interest.

The muddy sheet of river water covers the whole view seaward before its mouth, when there is not any wind or current setting against the natural flow of fresh water; but if south or north winds are prevailing, the muddy tribute of the Rio Bravo, instead of spreading out into the open sea, and commingling there undisturbed with the salt waters, is checked and pressed aside as a long narrow strip along the beach in the direction that the wind sets the current.

Considering these circumstances, it is therefore clear that the place of deposits, both of the sea and river, gathering about the mouth are kept in a continual and also somewhat regular motion.

Among the regular changes to which the bar is subject, the most important is that caused by the annual rising of the river, which occurs during the months of July, August, and September. By means of this increased fresh-water power the deposits are carried and kept further out at sea, perhaps as much as a mile from the mouth. During the rest of the year the bar again approaches the beach; the oscillatory action of the salt water prevailing for this time, it is scarcely half a mile off the mouth of the river. The hydrographical distances between the bar and the mouth may be found on map No. 1, in the archives of the Department of the Interior.

Besides these regular changes, others occur monthly and daily that depend on the prevailing winds from the seaside, or meteorologic influences of the country above, not including many accidental occurrences which usually escape the scrutiny of the common observers. Of the latter kind are the depositions of drift-wood, or even wrecks and pieces of timber, which, after being washed ashore and left for awhile, are apt to form the foundation of a small bank or bar. Other more perceptible causes are seen in the stormy weather raging upon the sea and in the hurricanes on land.

These agencies, incessantly at work, all tend to one result, no matter how different their form of action may be, that is, addition to the land. The ebb and flow of the tide, the current of the river and sea, though often acting in opposite directions, only collect and again distribute the various material brought together by both fresh and salt water along the beach, where is presented by these gradual accessions the now forming and youngest portion of the continent.

The operations of all these forces may be altered or varied by extraordinary influences that may occur at any time, as they have done in ages past, such as the change of river beds in the alluvial regions, the closing of the mouths of the river, and the opening of other outlets.

There is not much doubt that the Rio Bravo once had its main mouth far from its present locality, no matter how powerful the descent of its waters to the sea must have been in all time.

Boca Chica, as its name implies, may be considered, without question, as one of the outlets of the Rio Bravo, which has thus contributed to the formation of Brazos Santiago and Point Isabel.

The currents over the bar of Brazos Santiago pour in a channel of such force against the tide as to corroborate the inference that a still greater fresh water flow than that of the Arroyo Colorado, some 25 miles to the north, comes into this bay. A glance at the course of the lowest portion of the Rio Bravo leads to a similar conclusion, for it has a decided inclination to the northeast after reaching the lowest portion of the colluvial belt.

It may be that the persons who attempted several years ago to dig a canal from the third bend (above its mouth) of the river, towards Boca Chica, or Brazos Santiago, may have had similar ideas on this subject.

We have thus dwelt almost two long on the formation of the bar; but however inconsiderable this matter may appear, it is still highly important to know the agents by which restless nature is achieving its work, the more so as the very same powers, now augmenting the land from the seaside, have, in all human probability, been contributing to this end for ages. It really seems beyond question that these oscillatory motions of the waters with the sweep of the gulf stream have deposited during the various ages of the cretaceous and perhaps tertiary sea that sediment along the foot of the bold Sierras, which at the present day form the western and northern limits of the now cretaceous basin of the lower Rio Bravo.

Taking also into consideration the parallelism of the easternmost of the Sierras of Mexico and

the sinuosities of the Gulf Coast, there cannot be any mistake as to the relation of the one to the other. The various cretaceous terraces of the lower Rio Bravo basin, placed, as they are, one above the other, appear in this position as so many antediluvial tide-marks of that vast sea; on the bottom of which secondary and also tertiary formations have been deposited, together with all those fossil types of organic forms—each genus and species belonging to its respective geological day.

Like the tide-marks that are arranged in large concentric circles, and that have been brought about by the oscillatory motions of the waters, the organic remains (leaves in the mighty book of the history of creation) can tell each one a tale of the physiographic condition of the age during which it rejoiced in the functions of life.

Whilst the currents and other forces of the water, acting horizontally, placed the different strata along the foot of the ancient coast of that *secondary sea*, a vertical force was needed to bring the submarine strata above the level of the water. If there were no signs of such a power, we could be content in believing that since the formation of the submarine strata the salt water has receded. There is evidence, however, that does not admit any question of the upheaval of the country. The volcanic dyke before spoken of is the strongest evidence in favor of this conclusion; these basaltic strata projecting through the cretaceous, and generally, also, a part of the older secondary formation, have caused a rise in the whole of the cretaceous system. Thus the peaks and branches of this dyke naturally became the *caryatida* of the great geological edifice of this country, often bearing detached portions of the cretaceous strata far above their general level.

GENERAL VIEW OF ORGANIC REMAINS.

With regard to the fossil remains of the regions of the lower Rio Bravo, which have come to our knowledge, there are many among them common to the cretaceous formation of New Jersey. With this locality they are also quite synchronous, according to Mr. Conrad, who has examined them. The specimens of this character are mentioned in his enumeration of genera and species. Many of these fossil remains, however, seem to belong solely to the cretaceous formation of Texas, and are more particularly referable to the southern portion of the secondary strata, which, on their part, are also nearly allied to analogous forms of the cretaceous formation of southern Europe, especially that part lying about the Mediterranean.

To go here more into the details of this supposed relationship between the southern and northern cretaceous formations of both hemispheres is not the design of these pages. To such of our readers, therefore, that may be desirous of examining this matter further,* we would refer them to Dr. Roemer's work, already mentioned, which contains well-founded hints and proofs on the subject.

Besides the before mentioned interesting specimens, so important to the knowledge of the general distribution of fossil forms, several new species have come to hand which seem to be indigenous to the cretaceous formation of Western Texas. The enumeration by Mr. Conrad shows, so far, six new species. Since then, however, another set of organic remains has been sent on for examination; and it seems to be not improbable that still other new forms may be met with in this collection of ours, the second made on the lower Rio Bravo. It is probable that some of the specimens of this last set will prove the prevalence of fossils of the tertiary system, which may

* For a full exposition of this subject, see Dr. Hall's report, which concludes the Geology of the Boundary.

be more developed in the lower portion of the lower green sand belt. This, however, is a mere suggestion to point only to the regions where data may be sought for; by means of which the distribution and limits of an eocene, and, perhaps, even pleistocene formation could be recognized.

We had not the opportunity to make such an investigation. It therefore devolves on some other person to continue the researches necessary to a complete understanding of the subject, and to the advancement of science in general.

CHAPTER III.

GEOLOGICAL FEATURES OF THE RIO GRANDE VALLEY FROM EL PASO TO THE MOUTH OF THE PECOS RIVER.

By C. C. PARRY.

Having completed our general sketch of the external features of the country, as represented on the line of route in nearest connexion with the United States and Mexican Boundary Survey, we now retrace our steps, to detail more particularly the course of the Rio Grande, especially in its connexion with the extensive cañons by which its course is marked, above and below Presidio del Norte. In these we gain insight into the geological structure of a large and interesting scope of country, also connected with scenery unsurpassed for singularity and grandeur.

About 70 miles below El Paso the mountains on either side of the valley converge, and present a lofty barrier in the direct course of the Rio Grande.

Through these the river makes its way by deeply-cut chasms, exposing the geological formation and structure in the sectional faces presented by its precipitous walls.

We also see in this connexion the lower limits of that extensive aqueous deposit, forming what may be termed the *Great El Paso Basin*, which, by subsequent drainage in the progressive deepening of the bed of the Rio Grande, has brought to view the various terraced elevations marked along the course of the present valley in table-land bluffs and extensive gravelly plateaus.

In fact, in our progress down the river we shall have constant occasion to notice the connexion between these cañons, as marking the limits of upper basins of deposit. Thus the general course of the river represents a continuous series, in descending steps, of basins, more or less extensive, then a cañon, forming, as we may say, the *spout* of the basin, which again opens on a basin of lower level.

This simple statement embodies the great principle of formation that characterizes all this district, and gives to its topography a significance at once clear and instructive.

It is in these *barriers*, then, these *mountain dams*, that the character of the valley, as a whole, can be best studied, and the chasms by which the river pierces them furnish the true key to their geological development.

That portion of the Rio Grande thus marked by cañons and basins, extending from the first obstruction 70 miles below El Paso to Presidio del Norte, did not come under my own personal examination.

The river here follows a general *southeast* course, making its way through strata of disturbed carboniferous limestone, having usually a dip to the *southwest*. The river course thus cutting the strata unequally, we should naturally expect not so much of a continuous cañon as an unequal development of rock on either side, presenting, it may be, bold and abrupt faces on the one side, and comparatively low on its opposite, thus affording the means of following near the river banks, by crossing from one side of the stream to the other. This, indeed, seems to have been the course pursued by the surveying party, with their pack-trains, who were thus enabled to keep up a connexion with the line of survey.

We should also expect, as another consequence of this irregularity of feature in the rock exposure, not such a marked contraction of the river bend and channel as we should be more apt to find in the case of horizontal strata of equal development; rapids would be less apt to form, and lines of beach would be more frequent. Further on, in encountering the exposures of igneous rocks, these features would vary, and here would be the points characterized by greater obstruction to the regular course of the river, and also rendering a passage along its banks more impracticable.

Such are the general features, as well as they can be gathered from the maps of the survey and the geological features of the country through which the river here passes.

Approaching Presidio del Norte, the valley of the Rio Grande again opens upon a wide basin, closely resembling in all its external features that seen above, near El Paso. The table-land, however, attains a greater height above the river bottom, presenting steep bluffs, often 200 feet high. The river bottom is also more contracted, rarely attaining a mile in width, and frequently reduced by the adjoining table-land to a mere strip. The river spreads out, embracing in its course numerous islands of deposit, and forming frequent sloughs along its main banks, subject to regular overflows. It is to these several tracts, islands, and sloughs that cultivation is chiefly confined.

On the Mexican side the Rio Grande receives the waters of the Rio Concho, flowing from the southwest, and draining a large extent of country in the State of Chihuahua. This is the only constant tributary to the Rio Grande yet met with in our course downward; its waters at the usual height are clear, flowing generally over a bed of limestone pebbles.

The delta formed at the junction of this stream with the Rio Grande affords a patch of soil suitable for agricultural purposes, and is occupied by the Mexican settlement of Presidio del Norte. The town itself occupies a conspicuous site, on high gravelly table-land, overlooking both valleys.

On the American side, about three miles below the junction of the river, the greatest amount of bottom-land suitable for cultivation is met with; it is connected with the site known as Fort Leaton.

The bottom-lands in this vicinity are variously occupied by scattering growths of cotton-wood, willow, &c. The highest alluvial tracts are covered with a dense growth of mezquite; the table-land presents its usual desert vegetation.

The natural boundaries of this basin consist of irregular mountain ranges, composed principally of carboniferous limestone, similar to that seen above. As a general thing, the strata here appear less disturbed, but show not unfrequently a strong westerly dip.

In an east and southeast direction lies the range of igneous mountains called the "*Sierra*

Rica," forming the topographical limits of the basin in that direction. Through this range the river passes, and forms here the first of a series of gigantic cañons below.

There is no occasion to dwell longer on the general features of scenery connected with this Presidio del Norte basin. To apply the term *Rio Grandeish* would convey at once a clear idea to any one at all acquainted with the general aspect of scenery invariably connected with this desert stream.

This first cañon commences about twenty-five miles below the town of Presidio del Norte.

The general course of the river for this distance bears south 70° west, (*mag.*,) passing at several points rocky knolls of igneous character which abut on the river. On approaching the mountain range directly in front, it will be seen that the river, winding through the lower line of adjoining hills, suddenly contracts its channel, and thence tumbling over a series of foaming rapids, enters the mountain range.

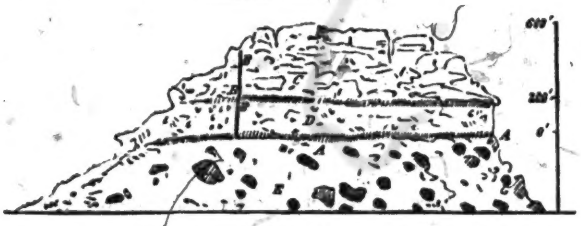
The rock exposure here is of a most remarkable character, and different from any heretofore met with. When the adjoining mountains, reaching a height of 1,000 to 1,500 feet, present a clear sectional face, we see a somewhat regular series, composed of lavas, vesicular or compact in texture, alternating with thick deposits, of an earthy form, of volcanic breccia.—(Specimen Rocks, No. 59 to 62 inclusive.)

The general arrangement of these formations shows them to be variable in thickness, and disposed in regular strata one above the other.

The dark-colored lavas form usually the upper capping, together with one or more intermediate seams. The intervening lighter colored breccias are often of considerable thickness, showing in some places a development of 300 feet or more, while at other points it is reduced to a thin seam. The usual appearance of these breccias is that of an earthy-stratified deposit, varying in color from a whitish brown to a dull green; its texture is more or less crumbling, being composed of a whitish paste, which contains, occasionally, minute pebbles of quartz rock.

In entering into the composition of mountain masses, these several formations assume very distinct and peculiar characters. Thus, where the earthy breccias are considerably developed, we see them exposed, along the sides of mountains, in perpendicular walls, capped by the darker colored lava rocks, which are frequently seen overhanging and forming a regular line of terraced platforms, thence rising upward in broken ledges to form a flattened summit. This

SECTIONAL VIEW OF BUFASILLA MOUNTAIN, NEAR THE COMMENCEMENT OF THE CAÑON OF THE RIO BRAVO, THIRTY MILES BELOW PRESIDIO DEL NORTE.



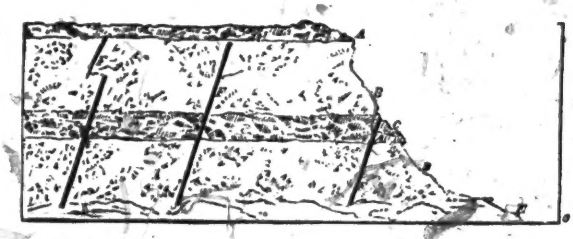
A. Lower exposure of trap-rock of closer texture than the upper stratum.
B. Vein of trap, six feet in thickness, traversing the intervening breccia formation, and connecting the upper and lower strata of igneous rock.
C. Vesicular trap-rock, dark colored, 400 feet ? thick.
D. Volcanic breccia in horizontal strata of light brownish color, 200 feet thick.
E. Talus strewn with blocks derived from the upper igneous stratum.

singular character of formation has given the name of "Bofecillos" to some of the more striking mountain ledges.

Owing to the crumbling nature of this underlying stratum, we find it variously washed and often fantastically shaped by the peculiarities connected with its various exposures; it thus frequently forms burrowing caverns and dark grottos, set off with misshapen pillars. Quite invariably we find its base occupied by a talus, derived from the overhanging rock, forming a rough slope strewn with irregular blocks; thus its connexion with the underlying rock stratum. This connexion is, however, occasionally brought to light, and shows a lower development of lava rock, differing but little from that above, except in a greater closeness of texture, the upper capping being generally vesicular, while that below is compact.

Frequently, however, a direct connexion between the separate lava strata is made by narrow dykes, identical in character with the rock above and below, passing through the intervening breccia. At other places, veins are seen shooting from above and below, and terminating in the intervening series.

SECTIONAL VIEW, SHOWING A SERIES OF VOLCANIC PRODUCTS, TRAVERSED BY INJECTED IGNEOUS VEINS; CAÑON OF RIO BRAVO, THIRTY-FIVE MILES BELOW PRESIDIO DEL NORTE.



A. Dark-colored vesicular trap.
B. Volcanic breccia of a lightish brown color in horizontal strata.
C. Lava or trap-rock of close texture, dark-colored.
D. Breccia as above, having a light greenish color.
E. Igneous veins.

We are now sufficiently prepared to appreciate the external features of the region thus characterized. We can understand how the unequal development of these several layers may give shape and character to the mountain ranges, and what diversified features they will necessarily assume, under the influence of denuding causes, acting so unequally on their separate members. The geological formation seems to conspire with the atmospheric influences to give a ruggedness and character of desolation to this region, of which description can give but a most meagre idea.

It is, however, in the line of the river-course that these rugged features present their grandest developments. We see the turbid waters of the Rio Bravo here contracted to a narrow channel, barely a stone's throw across, sweeping on a resistless current beneath bristling crags; now tumbling over foaming rapids, connected with some abrupt turn in the course of the stream, and then gliding smooth and unbroken through mountain clefts with perpendicular walls on either hand, rising to the dizzy height of 1,200 to 1,500 feet perpendicular.

In our progress through the range, the breccia deposit becomes less developed, and finally disappears altogether, or is seen only in narrow seams along the sides of the mountains.

The course of the river at first is not entirely hemmed in by abrupt rocky walls, a rough talus at the base affording a rude pathway, occasionally lined by narrow strips of sand beach.

At other places, however, all approach to the river, except by the route of its dangerous channel, is out of the question.

Along the course of the river, the mountain barriers are occasionally pierced by side chasms for the drainage of tributary mountain valleys. One of these is so remarkable as to deserve some separate notice.

At a point about seven miles from the entrance of the cañon, where the river is completely hemmed in on each side by the largest development of the mountain range, being unapproachable except in boats from above, there is a cut-off on the American side, leading by an open country over a gentle swell of ground, reaching the river about five miles below. This cut-off passes directly at the base of the high mountains intervening between this route and the river, having an average breadth of half a mile. At the summit of this swell is a depressed valley, the drainage of which leads directly toward this mountain barrier in its course to the river.

In following the dry-stream bed thus marked out, we find it entering by a narrow portal, about 15 feet in width below, thence cutting its way by a uniform cleft through the entire breadth of the mountains to reach the Rio Grande.

It thus presents a miniature picture of the larger cañon made by the Rio Grande. Its floor shows a smoothly-washed rock surface, in which basins frequently occur, bedded by washed sand and pebbles, and receiving the limpid issue of a small trickling stream. In its general course toward the river, it makes frequent zigzag angles, thus giving a new feature of scenery at every turn, and presenting altogether a most varied combination of the grand, grotesque, and beautiful. Along its sides is plainly observed a high-water mark, with an average height of 15 feet above the rocky bed, indicative of the sudden floods, derived from copious rains, to which this chasm is subject. This fact serves to give a somewhat nervous interest to its exploration. The height of the perpendicular walls on each side, corresponding to the thickness of the mountain range, is from 300 to 800 feet. The chasm thus formed opens up gradually towards the summit, forming a broken yawning abyss, untouched by sunlight, and having its depth exaggerated by the comparative dimness that shrouds it below.

Thus sheltered from the sun's scorching rays, and cooled by evaporation from its brimming basins of clear water, with its entrance fanned by a constant stream of cool air, this cañon forms a grateful retreat. Further toward the river the descent is made by several abrupt falls, forming extensive basins below. These are filled with clear water, and offer natural bathing places of a most attractive character. Its exit on the river presents the same general features of chasm, the final *debouchment* being marked by a *débris* of rocks and pebbles, which project into the main stream and form a difficult and dangerous rapid.

About three miles from this latter point, and twelve from the head of the cañon, the main development of the mountain range forming the Sierra Rica is passed; the final exit is through a narrow rocky portal, and presents the appearance of an immense gateway. The width of the river at this point is barely 80 feet; the adjoining mountain ridge on either side is so broken and rugged as to be impassable for animals.

On passing this narrow outlet we come upon a more open but still broken country, consisting of basins of limited extent, set off with the usual form of gravelly table-land. The course of the river is frequently obstructed by low rocky ranges, forming cañons; again pouring out of these cañons into the more open basins, it becomes expanded, and forms limited sand beaches, patches

of bottom-land, and occasionally small islands. This character continues for ten or twelve miles, when we enter on a more extended basin, through which passes the Comanche trail, leading from Upper Texas into Mexico, by the adjoining Mexican settlement of San Carlos.

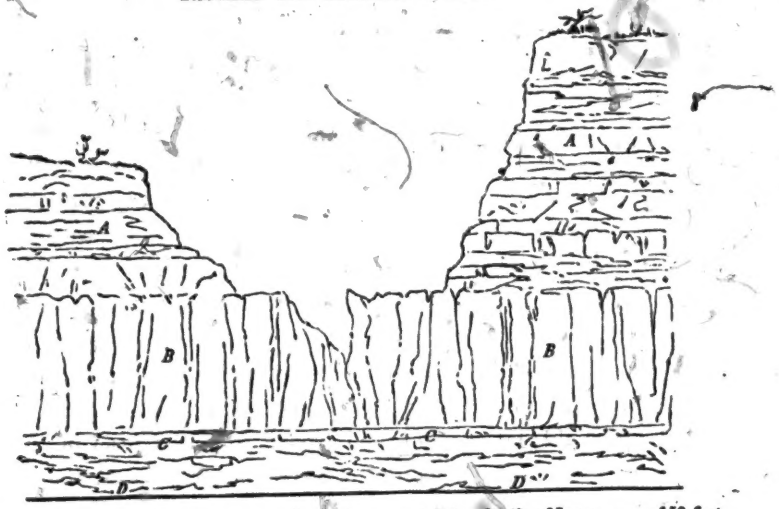
SECTIONAL SKETCH AT COMANCHE CROSSING, ON THE RIO BRAVO, BELOW PRESIDIO DEL NORTE.

A. Cretaceous limestone marked with large fossils of Inoceramus, inclining N. N E., at an angle of 80°.
B. Mesa, or gravelly table-land formation, resting unconformably upon A.

At this point the rock exposure exhibits outcrops of limestone belonging to the cretaceous period, being quite abundantly marked by fossil impressions of *Inoceramus*, often of large size. The rock exposure exhibits a very variable dip, mostly inclined towards the west, occasionally at a very sharp angle. It rises at various points in the adjoining table-land, forming ochreous colored rocky bluffs, where at several points the gravelly table-land is seen to rest unconformably on the sharply-tilted strata.

Further down the river, in an eastern direction, this cretaceous formation assumes a nearly horizontal position and a closer texture. It is here seen overlaid by a variable sheet of dark colored lava rock, corresponding in character to that noticed above in connexion with the Bofecilla mountains. This sheet of igneous rock is seen to conform closely to all the inequalities

SECTIONAL VIEW ON A RAVINE LEADING TOWARD THE RIO BRAVO DEL NORTE, NEAR SAN CARLOS, SHOWING IGNEOUS ROCK DIRECTLY ASSOCIATED WITH CRETACEOUS LIMESTONE.



A. Cretaceous limestone, having an earthy texture, containing fossils of Inoceramus, 150 feet.
B. Dark-colored igneous rock, 80 feet in thickness.
C. Cretaceous limestone of closer texture than that above, 15 feet thick.
D. Débris.

of the underlying limestone, exhibiting in the walls of the cañon below a distinct line of separation, traceable for a long distance. The westerly dip of the cretaceous formation underneath gradually thins out this upper igneous capping, which finally disappears, and solid limestone walls continue along the line of the river.

At one point on the line of the trail leading round the broken ranges of the mountain ledges, directly bordering the river, to reach its bed some eight miles below the Comanche Ford, the sides of a deep washed ravine bring to view the successive and relative thickness of the various exposures alluded to above.

We here see the upper members of the cretaceous rocks forming the tabled summits of the adjoining mountains, and marked by frequent cretaceous fossils, resting on a bed of igneous trap-form rock 50 to 80 feet thick, this again overlaying the closer layers of the limestone strata below.

Our further route, adjoining the river on the Mexican side, passes over high ground, based on limestone rock, and attaining a height of 800 feet or more above the river, the strata here dipping slightly to the west. We again reach the river-bed at the mouth of San Carlos creek, which, draining a considerable valley extending to the south some fifteen miles, affords a constant stream of clear water.

Just below this point commences the gigantic cañon of San Carlos, through which for ten miles the Rio Grande, pursuing a nearly due east course, makes its way. This cañon presents unbroken walls of cretaceous limestone.

The course of the river here cutting the strata in a line directly opposed to the dip, there is a

FALLS OF RIO BRAVO, NEAR SAN CARLOS.

constantly increasing elevation of the cañon walls. These walls commence with a height of between 200 and 300 feet; but the fall of the water combined with the rise of the strata, develops, in the course of ten miles, a clear perpendicular height of at least 1,500 feet above the river level.

A faint conception only can be formed from these facts of the truly awful character of this chasm. Its course can be marked along the mountain slope in a regular zigzag line, terminating by an opening cleft, which rises high and clear above the surrounding mountain ranges.

The surface of the ground adjoining the river bank is a slightly broken slope, extending to the east, and showing a continuous development of the range to the north and south. The general surface presents no indication of a river course, and you are not aware of its presence till you stand suddenly on its abrupt brink; even here the running water is not always visible, unless advantage be taken of the projecting points, forming angles, along the general course of the river. From this dizzy height the stream below looks like a mere thread, passing in whirling eddies, or foaming over broken rapids; a stone hurled from above into this chasm passes completely out of sight behind the over-hanging ledges, and one can often count thirty before the last deadened splash announces that it has reached the river bed. From the point formed by its last projecting ledges the view is grand beyond all conception. You can here trace backward the line of the immense chasm, which marks the course of the river, till it emerges from its stupendous outlet.

Below this the country presents from a bird's eye view an extended basin, set off by the rugged volcanic mountains of the Chisos, we trace the winding of the stream in the basin below, to which distance gives a softening character of fertility not by any means borne out on a nearer inspection.

OUTLINE VIEW OF THE CHISOS MOUNTAINS, LOOKING TO THE NORTH.

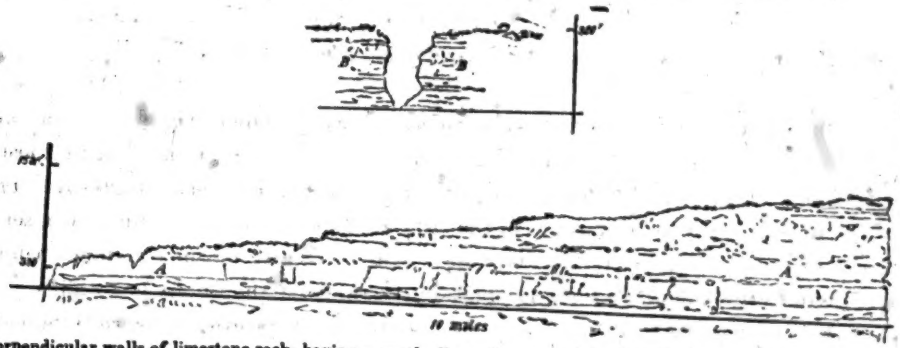
A. Dark-colored igneous rock of vesicular or close texture, disposed in vertical columns or horizontal masses.
B. Volcanic breccia in evenly horizontal strata, light-colored and of crumbling earthy texture.
a. Emory's Peak, 2,500 ft above the waters of the river, having the appearance of a crater.

Rumor had led us to expect, in connexion with this chasm, an extensive river fall, but such did not prove to be the case. Rapids, indeed, do occur sufficiently severe to render a safe passage by boats a virtual impossibility, but no distinct fall from an upper to a lower ledge of rocks was encountered by the surveying party. Indeed, from *a priori* reasoning, we should hardly expect to find such a feature in this location, where the strata are of such uniform texture, and where the evident marks of such long continued abrading forces tend to level the river bed.

All the rapids seen along the course of the river are connected either with a talus, thrown down from the projecting cliffs, or with the irregular deposit brought down from the beds of tributary streams.

Within this cañon there is rarely a foothold visible along the line of the ordinary water level, and at no place for the whole distance of ten miles would it be practicable to make a safe descent to the water's edge, still less to ascend. The "*facile descensus*" would here be truly "*Averni.*"

SECTIONAL VIEW OF A PART OF THE GREAT CAÑON OF THE RIO BRAVO DEL NORTE, NEAR SAN CARLOS.



A. Perpendicular walls of limestone rock, having a gentle dip to the west, giving increased height to the walls of the cañon, along the eastern course of the river.

B. Cross section of the cañon, showing the general shape of the chasm. (Same scale, horizontal and perpendicular.)

Note.—For 300 read 800.

It would be barely possible, in a time of high water, to conduct a boat safely through this stupendous chasm. A strong wooden boat, which accomplished the entire distance from El Paso to this place in the service of the survey, being here cast adrift, was found in broken fragments along the river course below. There are rumors among the Mexicans living near here of the attempted passage of this cañon by some daring individuals, but no authentic record of a successful result.

A perpendicular cross section of this cañon exhibits a rather peculiar feature, at least such as is not noticed elsewhere: thus, instead of a regular slope or perpendicular descent of the cañon walls on either side, we have an expansion of the breadth of the cañon at two distinct points, above and below. The vertical cross section would thus correspond to that of a pitcher, showing first a flaring top, then a contraction, and again bulging out below; the peculiarity consists in this lower expansion, but is evidently susceptible of a ready explanation. Thus, it may be regarded as due to the irregular action of river flood and recession, acting along its pent-up course in such a way as to exert a greater denuding effect on the sides of the chasm than on its lower bed.

Professor Hall has suggested that such a shape would be apt to result, in such situations, from the gradual diminution of the body of running water, naturally connected with increasing land elevations.

The average width of the stream within this cañon is probably about 100 feet; and when we come to include herein the immense floods that in other places spread out the river overflows for miles, we can appreciate its terrible energy when pent up within such narrow limits.

Sufficient has, doubtlessly, been said on this most remarkable feature in the course of the Rio Bravo; its details, however, will have a general application to what is to succeed, and render a more elaborate notice of the successive cañons unnecessary, all of which resemble the above in general aspect, but none equal it in extent and grandeur.

In order to reach the lower basin in the course of the Rio Grande, beyond the San Carlos cañon, you have to make an extensive detour, and pass again up the San Carlos creek about ten miles to the "Old Presidio of San Carlos." This now deserted adobe structure is situated on the eastern side of the valley, occupying gravelly table-land, and overlooking the alluvial bottom, which shows the remains of former cultivation in extensive lines of irrigating ditches. The cultivation carried on by the present inhabitants of San Carlos is confined to the upper part of the valley. These cultivated fields extend some five miles, and present a rich belt of alluvial soil, abundantly watered and consequently fertile.

On leaving the San Carlos valley, we pass by a southeast course over an upland, gently undulating plain, set off by occasional rocky knolls, and encircled by mountains mostly of volcanic formation. Our course thence, inclining more to the northeast, leads over broken swells of the limestone range pertaining to the cañon above described. Thus, by a series of steep descents, the lower basin of the Rio Grande is gained at a point some distance below the mouth of the San Carlos cañon, and nearly opposite the range of the Chisos mountains.

The general character of the valley here presents the usual features of gravelly table-land, flanking a narrow alluvial belt along the winding course of the river. The bottom-land here is again bordered by cotton-wood and willow growth.

Towards the exit of the river, from the San Carlos cañon above, the general aspect of the valley is modified by irregular outbursts of eruptive trap rocks, confusedly alternating with volcanic breccias.

The general course of the river through this basin is easterly; the bottom-land is of limited extent, and generally barren. At several points here are seen Indian fords and broad trails leading from upper Texas into Mexico. These beaten paths are unmistakable indications of the route pursued by the Camanches on their extensive foraging expeditions.

These routes, both to the north and south, are comparatively open, and are apparently determined by the depressions that occur in the elsewhere uninterrupted line of mountains.

The continuation of our land route down the river compelled us to cross, with our pack train, at one of the Indian fords called "*Vado Fleche*," thence taking along the Texan side to turn the spur of the mountain range forming the San Vincente cañon.

This range is exclusively composed of cretaceous limestone, similar in texture to that in the San Carlos cañon above. It differs from that, however, in being of less height and extent, and in showing, in place of a regular western dip, a distinct anticlinal axis, the dip being quite abrupt on either side. Cretaceous fossils, identical with those found at San Carlos, serve plainly to characterize this formation.

The cañon of San Vincente is very abrupt and of considerable height; the ridge adjoining is also very broken, exhibiting steep descents and branch chasms, which rendered the survey extremely arduous. The passage through this cañnon was accomplished by our India-rubber boats, one of which was, however, capsized in shooting a sharp rapid. On emerging from this range, the Rio Grande opens on the San Vincente basin, in which, on the Mexican, side is situated the now deserted Fort San Vincente.

This basin differs from all others yet seen in being exclusively formed of low ledges of a dark-colored stratified rock, showing low bluff ranges 30 to 50 feet high. These ridges have a very uniform dip of 15° to the northeast; they occupy in great measure the place of the usual

gravelly table-land, forming along the *line of strike* open valleys. Arid and bleak sterility characterizes this formation, to which the scant and sandy bottom-land is hardly an exception.

Fossils are occasionally copiously imbedded in these ledges; among which principally *Ostrea*, *Ammonites*, and *Turritella* occur, and show that the formation belongs to the upper cretaceous series. At some points there is an evident approach to the lower Tertiary formation.

VIEW OF PRESIDIO DE SAN VINCENTE AND SIERRA CARMEL.

The eastern limits of this basin are marked by the extensive and elevated range of the Sierra Carmel, presenting directly in front an unbroken wall composed of a light-colored limestone. This shows a dip to the east. Its western aspect exhibits a line of perpendicular escarpment rising in several peaked knobs to a great height. The line of mountain wall thus exposed presents a series of terraced elevations, dividing horizontally the abrupt face of rock exposure.

Along these terraced lines, and associated with the talus there accumulated, is a growth of dark-green shrubbery, strongly contrasting with the ochreous-colored wall, which forms the background.

This mountain range further to the southeast exhibits an extensive development of igneous rock, showing in the distance a very rugged outline.

The occurrence of these several ranges forces the river from its east and southeast course, and gives it an abrupt turn to the north. The mountain barrier is thence passed at a lower elevation of the main range forming the *Carmel cañon*. The river here cuts through the limestone strata, showing a distinct dip to the northeast; after a course of 8 miles, the river emerges on the eastern slope of the Carmel range. To accomplish the same distance with our mule train a detour of 40 miles was necessary, leading again to the river at the point where it emerges from the mountains. The operations of the surveying party being here suspended, our route hence led southward to the Mexican settlement of Santa Rosa, thence to Eagle Pass.

The eastern slope of the Sierra Carmel shows the strata of cretaceous limestone inclining eastward at an angle of about 20°; its exposed face is variously marked up by irregular trenched valleys and abrupt points and ledges, due to the natural denuding forces of water drainage and atmospheric action. This slope terminates in an irregular valley below, having its drainage to the north, and leading direct to the Rio Grande. Further south is conspicuous the extensive igneous development of the mountain range, rising in jagged peaks to an Alpine height, and presenting in the forest growth, which clothes its sides, agreeable features of verdure, contrasting strangely with the river valley and its bare outline of desert hills.

The most northern outlier of this igneous formation is the singular peak known as the "*Picotena.*" Lying at a distance of about 5 miles from the river, it rises abruptly from amid the surrounding limestone ranges, shooting up a sharp conical peak of basaltic structure. This peak, by its height and external features, presents a most striking landmark.

The country stretching to the north and east in the course of the river is less interrupted by high mountain ranges than has yet appeared on the line of our route, and presents features precisely similar to those before noticed in connexion with the lower valley of the Pecos. Igneous exposures disappear altogether, or are of very limited extent, and the limestone strata are but little disturbed. The numerous deeply cut valleys leading to the river are bounded by abrupt walls, rendering travelling, except in the direct line of their drainage, next to impossible. In attempting to follow down the river with pack animals, the only practicable course was to follow up to near its head one of these tributary ravines, thus reaching the general table summit, and then to pass over to and down another ravine leading to some uncertain point of the river below. By this plan it not unfrequently happened that, in order to make a distance of 5 or 6 miles by the line of the river, a detour of 30 miles or more was necessary. Each of these detours, moreover, leads over a country destitute of water, except the uncertain rain water retained in rocky wells, which generally occupy positions inaccessible to animals.

This character of country continues hence uninterruptedly to the mouth of the Pecos river, about 80 miles distant, presenting great uniformity in the general external and geological features of country.

Our course led along the eastern base of the Sierra Carmel, bringing to view, in connexion with its larger development of igneous formation, a section of country extremely picturesque, including well watered valleys, timbered mountains, and upland plains covered with a luxuriant growth of nutricious grass.

Indian traces abound in these vicinities, and the deep recesses of the adjoining mountains afford secure retreats, where the animals plundered from the Mexican settlements are driven to recruit, in preparation for their passage across the Rio Grande into Texas.

To this character of country again succeed ranges of cretaceous mountains, showing a general easterly dip of strata, and connected with upland basin plains mostly waterless.

At a distance of about a hundred and fifty miles south from the Rio Grande we reach a system of elevated basins, having frequently a drainage distinct from the valley of the Rio Grande, forming extensive inland lakes fed by numerous rivers. The noted *Bolson Mapimi* is the largest example of this lagoon formation.

Several, however, of these lagoons on the northern edge of this elevated area give rise to tributaries which empty into the Rio Grande. Of this latter class, the "*Laguna Agua Verde*"

is an example. Along the line of one of these valleys last mentioned our route led, thus threading our way through the mountain barriers, forming the northern line of the Santa Rosa range, thence emerging on this charming valley a short distance above the town of Santa Rosa.

The route thence to the Rio Grande at Eagle Pass is over an open country, occupied by low swells of cretaceous limestone, thus merging into that character of country pertaining to the region of central Texas.

For further details of the lithological character and fossil contents of the various rock exposures above alluded to, reference may be had to the lists of Mr. Conrad and Professor Hall. A very interesting paper from the latter gentleman also contains important generalizations, derived from examination of the various geological specimens collected in this and other expeditions.

The numerous illustrations of scenery from various sources will supply all that can be desired in regard to the general aspect of the region under consideration.

CHAPTER IV.

GEOLOGICAL OBSERVATIONS ON THE COUNTRY ALONG THE BOUNDARY LINE LYING BETWEEN THE 111TH DEGREE OF LONGITUDE AND THE INITIAL POINT ON THE RIO COLORADO.

[By Arthur Schott, Assistant U. S. B. C.]

Geographical terms for this section of the boundary line would be Sonorian or Pimerian, as it runs through the northwestern part of Sonora, which also bears the old Spanish name of Pimeria Alta (High Pimeria;) and since it intersects both meridians and parallels in an oblique direction, it is called, in geodetic language, "azimuth line." This line lies entirely on the eastern slope of the basin of the Gulf of California, and falls on *the divide* separating the waters of the Gila from the streams of Northern Sonora, which, after flowing in a southwesterly course, empty into the Gulf of California.

The hypsometrical and general geological features can only be expressed approximately, for circumstances prevented actual measurements.

At the eastern end of the azimuth line is the Sierra del Pajarito, from the highest point of which an imaginary line drawn to the Rio Colorado would give a grade of about 22 feet to one mile, or its equivalent, 0.41 to 100. The highest point may be set down at about 5,200 feet above the level of the sea. This point does not, however, reach the pine region, which in this latitude may be considered as occurring at an elevation of not less than 6,000 feet. A monotonous simplicity is a characteristic of the topographical features of Northwestern Sonora; and but for a close examination, there would only be disclosed a mere dualism of diluvial drift and pluto-volcanic mountains. The drift covers many of the mountain ranges almost to the tops, particularly those which approach the bottom-lands of the Colorado.

The northwestern part of the line runs over what may be called a veiled country; for of the mountains, only their crests are to be seen above the desolate sand-flats of the general level of the surface. It is through these forsaken barrens that the Rio Colorado, with its timbered bottom, winds its course towards the waters of the Gulf.

Comparing the geological edifice with the structure of animal organism, the mountain ranges jutting up through this vast level of drift represent the skeleton; the diluvial main the sinew and muscle; and the alluvial deposits the tegument or epidermis. The last mentioned is poorly represented. The scant vegetable cover facilitates, however, the observations of the geologist.

Alluvium is seen first and as the uppermost stratum; except at the extremities of the line, there is, however, but very little to be met with. As might be expected, it abounds most in the bottom-lands of the Colorado; but, strange to say, it is even in greater abundance on the highest mountains than on the plains. It frequently collects in such quantity in the little valleys and in the cavities of the broken sides of the mountains as to give rise to a more complete develop-

ment of vegetable life. The plains exposed to the drifting sand as well as to climatic severities are almost wholly deprived of an alluvial coat. A few traces may be looked for at the so-called "Playas," (depressions in the plains.) What little rain may fall collects here, and bringing down with it the lighter particles of the surrounding soil, affords a foothold for vegetation, which presents, however, more a mass of equals than a diversity of species and genera. Often, apparently, this premature effort of nature to develop vegetation is sadly counterbalanced by the saline character of the soil, which causes the prevalence of corresponding forms, as obione, salicornia, salsola, chenopodium, and others, in the place of algarobia, prosopis, or even salix, the usual types in analogous localities.

The plains lying between the mountain ranges are formed of a more or less uniform deposit of loose diluvial sand, its composition not differing essentially from that of the adjoining mountains. This diluvial main may, therefore, be called the debris of the adjacent mountains and of the underlying mass.

As to the formation of this diluvial main, we incline to the opinion that it is the residue of a sea once a connecting link between the waters of the Atlantic and Pacific. Changes in the constituents of this deposit certainly occur; but they are of a local character, besides having a certain uniformity. Fragments of quartz, mica, feldspar, and other similar elements of crystalline and igneous rock, associated with calcareous particles, constitute the formation of that vast region of deserts stretching from the eastern foot of the California Cordilleras to the table-lands bordering even the Rio Bravo. This section of country may thus be viewed as the bed of an ocean variously intersected by numerous reef-like or dyke-shaped mountain ranges.

In the immediate vicinity of the mountains, isolated beds of pebbles are sometimes seen, the lithological character of which indicate their origin. These pebbly beds, however, must not be confounded with similar ones occurring occasionally about the centre of the desert basins and frequently along the dry water-courses. The former are the disintegration of the rocks, unmoved from their original locality, whilst the latter are gatherings of an immense area. The latter bear evidence of being brought from the most opposite and most remote geographical quarters; pieces of limestone representing both the carboniferous and cretaceous periods with tertiary and even traces of lime recently precipitated; these fragments are mingled with agate, chalcedony, semi-opal, opal, jasper, slates, silicia, breccias, and crystalline and amorphous conglomerates; here, also, are silicified, agathized, or opalized fragments of wood side by side with pieces merely incrusted—scarcely metamorphosed or entirely unchanged, and of quite a recent geological date; semi-opal, formed entirely of shell, whose age is readily recognized by the numerous nummulites associated with it; agate, with neat fragments of encrinitic or coraline forms; jasper or hornstone, which, under a common lens, discloses both the texture and grain of coniferous wood; opal, exhibiting traces of the structure of fossil-wood, with distinct annular concentric rings, but no marks of the grain could be detected; glass-opal, and hyalite, containing casts of some forms of the coral age pisolites, in appearance like a toadstone, which are either unchanged or metamorphic. The deserts of both sides of the Colorado and along the Gila abound with these pebbly beds, surrounded by and occasionally entirely buried in the sand. To the scientific observer they are pearls of this vast terrestrial ocean, which once formed the bottom of a sea, whose currents in all probability collected these pebbly deposits. Since the

water has receded, an ocean of a more subtile character sweeps over this area. Æerial currents are now driving the shifting sand from place to place as the waters of the sea once did.

Besides the general inclination of the western slope of the Sierra Madre towards the Gulf of California, an increased inclination of stratum is perceptible around the bases of the intersecting sierras. This does not, however, affect the mean ascent of the main land, and may be ascribed solely to the deposition of debris, as the angle formed by the inclination of the diluvial deposits was observed (particularly in the valley of the Santa Cruz river) to be = 2.5°.

The general ascent already referred to is conclusive proof of the action of upheaval forces since the deposition of the quaternary or diluvial drift. A straight line over its surface from the valley of the Colorado to the foot of the Sierra del Pajarito, where it ceases, gives a grade of 12.44 per mile, or 0.23 ft. in one hundred. In some valleys heading on the slopes of this sierra this deposit may be seen; but its occurrence in such localities being exceptionable, does not affect the mean angle of inclination of the stratum.

The height to which this diluvial main rises, in its approach to the Sierra Madre, gives a striking peculiarity to the features of the country. But for it the rugged crests of the sierras would be scarcely accessible.

If the climatic conditions were favorable, these now bleak and forbidding mountains would present a region teeming with vegetable and animal life. Instead of that, this country now lies an arid waste.

The few periodical streams descending from the mountain sides share a similar fate, for no sooner do they reach this drift than they disappear from the surface, sinking to unknown depths, and leaving only in the vicinity of the mountains slight marks of rudimentary drainage, clumps of shrubbery bordering dry water-courses.

The vegetation peculiar to the diluvial main is similar to that of the corresponding localities on the eastern side of the Sierra Madre and west of the Colorado. Besides smaller and more inconspicuous forms, are the Larrea, Fouquiera, Obione, and other chenopodiaceous shrubs; there are also a variety of leguminous plants, numerous members of the Cacti family, and some few bushes and trees, all well known to the traveller whose fortune has led him through these desert regions.

In passing to the consideration of the underlying strata—those upon which the diluvial deposits rest—a deep step is made at once; constituents of the secondary age seem to be wanting. Crystalline rocks of primary and transition age—more or less metamorphic—constitute the bed upon which the diluvial deposit lies. This bed does not occur as an even or slightly inclined plane, for its surface is variously broken by eruptive masses. These upheavals have not only disturbed and protruded through the primary and metamorphic strata, but carried with themselves masses of the latter above the level of the supercumbent deposits. Thus are formed the mighty sierras now representing the frame-work of our geological edifice, most of which may be distinguished as Pluto-volcanic.

With the hypsometrical features of these sierras, better called cordilleras, three important peculiarities are connected. These are, 1st. Parallelism among themselves, with the Gulf of California, and with the Pacific coast. 2d. Articulation. 3d. General petrographic relationship.

The parallelism is a fact now better understood than the natural laws which effected it. The linear extension of the axis may be supposed to be the result of electro-magnetic forces combined with the action of tidal currents, together with other causes, such as isothermal, isoclinic, and isodynamic currents. We offer the following explanation, founded on our own observations: After the first formation of the dykes and reefs composing the sierras, the result of volcanic forces, acted upon by electro-magnetism, sedimentary strata commenced to be formed. The igneous forces, however, at this time prevailed, and as a consequence, the strata of that era exhibit a crystalline character. By the increase of volcanic detritus and sedimentary material, the igneous ejections were confined to certain fissures only, whilst the action of aqueous forces became more general. The crust thereby becoming more and more firm and overlaid, the molten masses had to seek other outlets, determined, perhaps, by the character of the sedimentary rocks through which they led. To the stratification, lamination, and cleavage of the sedimentary rocks, as determining the subsequent direction of these volcanic forces, we may ascribe the formation of the catenary mountain ranges and dykes, and the cellular system of their intermediate bases.

The mountain ranges are mostly one-sided upheavals of metamorphic strata; the dykes, on the contrary, are essentially volcanic eruptions. The two classes of mountains are seen in a diversified combination of volcanic, plutonic, and aqueous or sedimentary rocks; syenitic and granitic lavas; trachyte and trap still exhibiting clear traces of lamination, cleavage, and stratification; granite, gneiss, syenitic, and various transition slates. How far this view may agree with the observed geognostical data, the special survey will show.

Before entering on this subject, we propose some remarks on a few Spanish terms which define their objects with a precision that could hardly be otherwise arrived at except by much circumlocution. These words are—

Cordillera, which means a long, continuous range of mountains, composed of several ridges, sometimes united by cross spurs, and intersected by passes or narrow valleys. The essential characteristic of this word is, that it means a mountain composed of two or more ranges forming one orographical body, just as several strings twisted together make a cord. The words cord and cordillera are formed from the same stem.

Sierra, a saw, indicates a mountain range with a serrated crest. A cross section of either sierra or cordillera is very small compared with its longitudinal axis.

Cuchilla.—This signifies a branch or outrunner of a sierra, which it usually resembles in its physiographical character. Its sharply edged crest, in all probability, suggests its name—cuchilla meaning knife.

Picacho means a sharp peak rising conspicuously above a surrounding mass of mountains; its height bears the same proportion to its width that the longitudinal axis of a sierra does to its cross section.

Puerto—a gate, or gap, and also a post. In its topographical application, a pass over or through a mountain range.

Cañon implies a defile or mountain pass without any outlets on either side.

Loma is a long mountain, or ridge of hills, with a somewhat smooth and flat surface. *Lomita* is the diminutive form of the same word.

Mesa is a table-land, table-mountain, or a flat-top ridge. *Mesilla* is the diminutive.

Malpais—literally, bad land; the "Mauvais terre" of the French. In Sonora it is exclusively applied to mesas, lomas, or any more or less elevated plateau formed of igneous rock, here mostly a compact or vesicular trap or basalt.

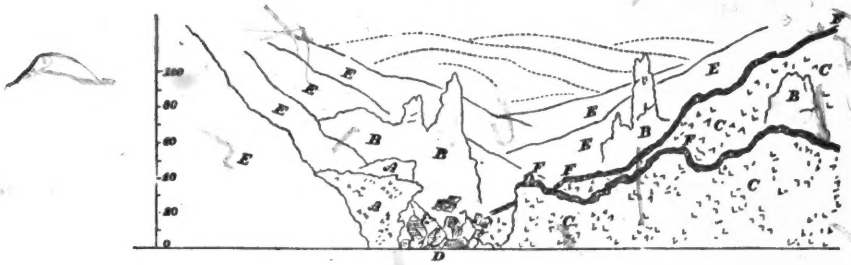
Ciénaga is a valley, or depression in a plain, where the water collects, and can only escape by an obstructed outlet. Such a place is usually miry and boggy.

Charco means a hole in clay, or stratum of rock, where water collects, and from which it cannot run.

Tinaja is a water-hole, found in the crevices of rocks and ravines, difficult of access. The primary meaning of this word is an unglazed earthen jar, burned so as to allow exudation. The water thus oozing through evaporates and keeps that remaining inside cool.

Beginning at the intersection of meridian 111° and parallel 31° 20′, we proceed to the consideration of the various sierras crossed by the line.

The Sierra del Pajarito (little bird) shows crystalline transition rocks, metamorphic and unchanged; also, trachytic strata, or metamorphic forms of granitic and syenitic rocks,(E.) Some of the more elevated portions exhibit a rough cellular surface, whilst the lower are smooth and more compact. The tint is light pink, or flesh color. This rock contains much glassy feldspar, and, occasionally, particles of augite, indicating the frequent occurrence of a syenitic granite. A fine-grained, white, metamorphic syenite, consisting of minute particles of hornblende and white feldspar, occur on some of the cuchillas on the north side. On the lower parts of the west slope talcose (argillaceous) and quartzose slates are met with, though trachyte dykes range through in every direction; in the bottom and slopes of the valleys the igneous rocks prevail. In one place a solid mass of trachyte is cut through by an arroyo, forming a puerto, flanked on both sides by vertical walls of eruptive (A and C) rocks fifty feet thick. The mountains on both sides slope towards this gap at an angle of 35 to 40 degrees. Here, and other localities along the foot of this sierra, pudding stone, volcanic breccia, feldspathic porphyry, and trapitic amygdaloid rocks abound. Some of the water-beds are lined with a singular formation, (B,) and apparently of a later age than those just mentioned. At first sight it may be considered a fresh-water deposit, overlying or placed alternately with volcanic breccia.



SECTIONAL VIEW OF THE VALLEY DE LOS JANOS.

Occasionally traces of stratification, and even cleavage, are visible, especially in its upper part; its lower portion is cemented into a solid mass. Its color is a light brown, or dark ash-gray. The outer crust looks as if it had been subjected to a process of calcination, for it readily crumbles or exposes a marl or chalk-like substance that could be easily scratched out with the finger. There were no means at hand to identify this as carbonate of lime; yet we were

inclined to the belief that the whole mass of apparent fresh-water deposit was cemented by this material, which also formed the matrix of the volcanic breccia. The trapitic and amygdaloid rocks (F) appeared everywhere, no matter how great the elevation, slightly blended with carbonate of lime, as if it had been precipitated there by water. This calcareous precipitation was espe-

VALLEY OF "LOS NOGALES."

cially perceptible in the vesicular cavities of every trachytic or basaltic boulder, and also in the fissures of the rocks and in the dells where these latter are imbedded.

On the east slope, in the valley of "Los Nogales" (Walnuts,) similar strata line the various

water-courses, sometimes forming a continuously winding low bank, or terrace, on both sides, and sometimes covering the slopes of the adjoining mountains, composed of metamorphic rock.

On the hill-sides there are beds of this formation dipping towards the valley, and exhibiting, by decurrent, undulating lines, a shaly, laminated texture. On the easternmost limits of this valley the same formation is still more developed; and it can be seen in all the valleys to the south and southeast of the Sierra de Santa Barbara, which is a part of the cordillera embracing the Sierra del Pajarito. The volcanic breccia, in many of the ravines, form walls of from forty to fifty feet in height, varying from an angle of forty-five degrees to perpendicularity. Pieces of this breccia, heated in a log fire, and then thrown into cold water, showed much effervescence, without fracture.

North and northwest of this mountain range, bearing east and west, the Sierra Janos rises up in bold terraces of dark-brown amygdaloid trap and porphyry, the broader terraces being nearer the base. These gigantic shelves are bordered with rocks projecting out in the most fantastic shapes. They incline toward the main body of the sierra—deep and lateral valleys intervening. A huge block, exhibiting on its south and west side gigantic walls, with distinct stratification and cleavage intersecting at right angles, constitute at once the centre mass and the peak. The rectilinear fissures are visible at a distance of ten or fifteen miles, and giving the igneous walls more the appearance of mason-work than the result of volcanic action.

This sierra's vernacular name, "Janos," bears no reference to its petrographic character. The word signifies, in the language of the Papago Indians inhabiting this country, an arborescent shrub of the bignoniaceous order, belonging to the genus "Chilopsis." Its frequent occurrence here in the water-beds in this vicinity may have originated the name.

On the northern slope of the Sierra Janos another group of mountains occur, known as the Sierra Atascosa. Its bearing is the same as that of the Sierra Janos, and its longitudinal axis is common to this sierra and that of Sierra del Pajarito. All these three links of the cordillera have both dip and strike alike, the dip being to the east. Its petrographic character is similar to that of the Sierra Janos, and, being closely connected orographically, may be considered its twin. The cordillera formed by these three mountains terminates with the Sierra Atascosa, which is separated by a narrow and rugged valley from the Sierra del Babuquibari, lying to the northwest. This valley is of some importance, not only for its valuable fresh-water springs, but also as affording the only means of communication between the settlements of the Santa Cruz River valley and the coast regions along the Gulf of California. A rancho was once established at these springs, bearing the Papago name of Aribaca, or, more properly, Aribac. The settlement has, however, been abandoned long ago, in consequence of the repeated depredations of the Apaches. The northwestern part of the sierra is composed of igneous rocks, towering up into peaks of the most grotesque form, and bearing, not inappropriately, the name of "Malpais."

Atascosa means "miry," which probably has reference to a previous state; it now presents the appearance of being an upheaved, boiling, volcanic pool. This sierra and that of Janos have about the same elevation above the Santa Cruz valley.

Springs abound about the Sierra del Pajarito, but their drainage being, for the most part, below the surface, it requires a well-practised eye to detect their presence, particularly during the dry season, which occurs in April, May, June, and sometimes July. There is a considerable

development of vegetation on this sierra; the rough surface of its sides is covered with a dense growth of shrubbery, of which some are quite trees, and grass is luxuriant in all the valleys. There are several species of oak, and on the summit is found a cedar; though this ridge does not fully reach the pine region. This sierra partakes of all the physiographical features of the Santa Barbara, Santa Cruz, and other links of the Sierra Madre further east. The Sierra del Pajarito, with its dependencies already referred to, constitute one and the same mountain system, properly characterized by the word Cordillera, and, taken collectively, are known as the Arizona Mountains. This word probably belongs to the soft Papago language, but we could not learn its meaning. The Arizona Mountains are rich in silver, copper, and gold; evidences of numerous and well-worked mines are still to be met with. The eastern slope of the Sierra del Pajarito (Los Nogales) is especially worthy of exploration with reference to a development of its mineral production. Specimens of silver from this locality were analyzed, and the result will be found in its proper place.

The Sierra del Pajarito constitutes a part of the divide already referred to, and has been intentionally dwelt upon at length for the purpose of referring the other sierras to it as a standard of comparison in consequence of its typical character, both as to its hypsometrical and geological features.

Looking westward from the peak of the Sierra del Pajarito, a rugged net of mountain ranges is spread out, made up of metamorphic rocks; and though the single sierras do not rise very high, they form a very bold mountain relief by the close, uninterrupted texture of the inclined plane which constitutes them. (See outline sketches Nos. 34 and 35 of the azimuth line.)

At a distance of about sixteen miles another cordillera is visible, between which and the Sierra del Pajarito very little drift occurs; and this is confined only to the intervening valleys, where mesas and lomas, forty to fifty feet in height, are formed by the drainage from the surrounding mountains. Near where the drainage from the east slope of the Sierra de la Escondida joins that coming from the southwest side of the Sierra del Pajarito, a point just south of

SECTION ON THE NORTH SIDE OF THE CERRO DE SONORA.

the line, permanent water is to be found. It is under a cleft of igneous rocks, and does not properly deserve the name of a spring, but is rather a tinaja supplied by water trickling through the rocks from water-holes above. From the character of this place is taken the name Escondida, (agua escondida meaning hidden water,) a term which is generally applied to the whole sierra. In its orographical character, this sierra is but a volcanic dyke,(A) towering up into an isolated, rugged crest of igneous rocks, composed of amygdaloid, porphyritic, and trachytic compounds, intersected and overlaid by contorted and overthrown crystalline strata of a coarsely-grained and frequently disintegrating feldspathic syenite(B.) This syenite is sometimes meta-

morphic, at other times unchanged; sometimes it is quartzose, and imperfectly mixed with large scales of silvery mica, in other places feldspar prevails.

This sierra is scarcely more than one mile wide where the line crosses it; both sides are bordered by the upheaved and contorted crystalline beds just alluded to. We ascended to the top of this sierra, near where the singular-looking peak that marks the Escondida towers up, and found it to exceed in barrenness either of the sierras—Pajarito, Janos, or Atascosa. Portions of the terrace-like slopes, and also the platean, are covered with patches of white or pearl-colored chalcedony, investing the rocks with a scoria-like crust of that silicious fossil. The southern part exhibits a more horizontal arrangement, leading to the supposition of having been formed under water; for here are extensive table-lands, ridges, lomas, and mesas, composed partly of black vesicular or compact trap, and partly of real quaternary banks. The topography of the country seems to indicate here the confluence of numerous mountain streams and torrents coming from every direction. (See sketch No. 40 of azimuth line.)

The line crosses a little to the north of a conspicuous peak(D)—the highest point of the whole range—and falling on the Mexican side, we gave it the name of "Cerro de Sonora."

Immediately west of the Sierra de la Escondido a low group of granite hills(C) occur, furnishing several temporary, as well as permanent, water places, apparently well known to the natives—Papagos and Apaches. Some are mere tinajas; others real springs, though liable to become dry before the setting in of the rainy season. While encamped here we experienced a heavy hail and thunder storm; in a few minutes water came rushing down the ravines in a torrent, five feet deep, carrying everything before it, and giving us unmistakable proof how little time it requires to submerge all the valleys around under a most terrible flood of rain-water. This mountain group was called "Granizo," (hail,) and is so designated in the maps from the circumstance of the surveying parties being overtaken here by one of those hurricanes peculiar to these regions.

A flat valley, nine miles wide, separates the Sierra de la Escondida and the adjoining Granizo group from the Sierra Verde, which is a southern spur or branch of the Sierra del Babuquibari, north of the line. The plateaus bordering the dry water-courses of this valley furnish fine grass, and are sparsely covered with well-developed hackberry and liveoak. The Sierra Verde, so called because of the verdure encountered in the shelter of its rocky valleys, seems to be formed exclusively of feldspathic granite, similar to that already mentioned as occurring on the east slope of the Sierra Escondida. The strike-side faces southwest, and with a width of scarcely more than a mile, this sierra does not present any petrographic novelties. Its longitudinal axis ranges southeast and northwest, and joins the bold walls of igneous rocks belonging to the Sierra Babuquibari. At its southern end mounds of dark, vesicular trap crop out of the diluvial main. Here water finds its way to the surface, forming a spring known as the "Pozo Verde," (Green Well;) the bunches of rush, which at once conceal and mark the water, in all probability gave rise to the name.

Almost due north of the Sierra Verde lies the picacho of the Sierra del Babuquibari, which is one of the orographical phenomena of the country, its peculiarity being such as to attract especially the attention of the red man. The Papagos consider this huge mountain obelisk their palladium; here they take refuge in times of famine, drought, or war. Babuquibari is said to signify "water on the mountain." The word is certainly formed from babu (water) and ari

(rock or mountain.) Its great height, added to its spire-like top, causes it to act as a conductor to the clouds, and thereby gather an unusual quantity of rain, which is retained for a long time in its numerous rugged and inaccessible recesses. (See outline sketch No. 39, azimuth line.) Viewing the country westward from the Sierra Verde, a wide plain is visible, bounded at a distance of fifteen miles by a mountain range traversing the country with the invariable bearing southeast and northwest.

The eastern half of this plain is favored with a more than usual cover of vegetable life—abounding in grass, a dense growth of brushwood, and mesquite; the western part, a low flat, was entirely destitute of vegetation, which seemed to have been destroyed by small troglodític quadrupeds of the order *Rodentiæ*. Although this plain had received copious showers of rain a few days previous to our visit, singularly enough no life was given to the naked and barren flat. A change, and not to its advantage, is here perceptible in the physiographical features of the country, and becomes quite decided in the next mountain range, which is unlike all the sierras eastward, and which presents an isolated group rising out of the diluvial main.

Notwithstanding its lesser extension, the Sierra de la Union presents no peculiarity in its petrographic character—being a compound of igneous and metamorphic rocks. The latter constitutes the greater portion. On the east slope feldspathic granite in a disintegrating and somewhat metamorphic state occurs; on the west is a quaternary granite, similar to that mentioned as occurring on the Sierrita del Granizo. The backbone or central mass is formed of igneous amygdaloid and porphyritic rocks, here and there overlaid and concealed by crystalline strata.

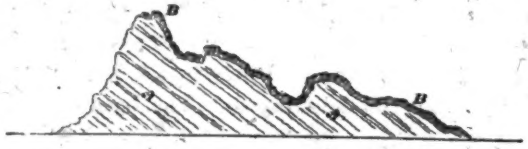
Thus far there has been but little room for the diluvial deposits, so broken up is this region by the continuous succession of mountain ranges; but westward, great basins of quaternary and alluvial deposits form the main in which the sterile mountains lie imbedded and completely isolated by this vast sea of drift. Of the sierras ranging eastward, parts of them are so entirely submerged as to appear detached and isolated mountains, their connexion being traceable only by their general bearing. The country passed over may be viewed as a narrow strait, traversed by long mountain reefs, and that, in part, as a coast of shoal water dotted with rocky islands. The influence of the climate of the Gulf coast, as far as the Sierra de la Union, is quite apparent; on its west slope two leguminous trees, the Palo verde and Arbol de hierro of the Mexicans, Cercidium floridanum and Olneya Tezota, three large Cerei, two gigantic Echinocacti, and other desert forms, now appear in prevailing numbers.

The line, after crossing a desert of about seventeen miles, strikes a comparatively low and narrow sierra, composed chiefly of porphyry and amygdaloid rock. This sierra presents two vertical peaks, rising up like a pair of horns, which constitute natural monuments for the line as it falls between them. It is a northerly continuation of the Cordillera Cobota, so called by the Papago Indians, who have several fixed settlements here. There is a cañon in this sierra, near the line by which the west side is easily gained, and in which are seen masses of crystalline rock; igneous strata, however, prevail. The name "Lindero" (boundary or landmark) was given to this sierra, because of the line falling between the two conspicuous peaks before mentioned.

The sierras Arteza and Soñi lie, respectively, southeast and northwest; the former in the United States, the latter in Mexico, both well known and famous among the natives as being

remarkably auriferous; especially Soñi, once a mining settlement of the Mexicans. It was abandoned at the time of the California gold fever. The latter subsiding, the old settlers, disappointed on the Pacific coast, are now returning again. The Papagos claim this region, and, from the time they first learned to appreciate the value of gold to the present day, have continued to prospect successfully.

A desert of sixteen or eighteen miles in extent separates the Sierra de los Linderos from that of la Nariz. Though these sierras are nearly related in petrographic character, there exists one striking difference. The former is, at least where it was crossed, a true volcanic dyke, bordered in some places by upheavals of crystalline strata; its crest of eruptive rocks seems to have been forced through a mass similar to itself. The latter, though consisting also of trachyte and trapitic masses, appears only a simple upheaval; its crest, comparatively smooth, is the upturned edge of a bed of igneous masses, dipping northeast; its strike faces the west, at an angle of 60 to 70 degrees. The surface (B) of the east slope is covered with a thick layer of loose boulders, of a black or dark-brown vesicular trap. On the strike, stratification (A) is visible, even at a considerable distance, the layers varying in thickness from five to twenty-five feet.



VERTICAL SECTION OF THE SIERRA DE LA NARIZ.

This sierra ranges in a slightly curved line from southeast to northwest, and joins about eight miles north of the line the Sierra del Ajo, of which it is, in fact, only a spur. A little to the north of where the line strikes, quite a depression occurs, the range here not being more than fifty feet above the drift.

A valley of about fifteen miles wide separates the Sierra de la Nariz from the Sierra de la Laguna on the north. Its petrographic character seems to be similar to the de la Nariz, having the same strike, dip, and stratification. Trap mounds accompany both sierras, cropping out along their bases to a height of thirty or forty feet above the level of the valley. There are no springs to be found about any of these mountains; holes of water or ponds, (charcos and lagunas of the Mexicans,) formed in beds of clay, are the only dependence for water, and are not to be relied on during the whole season. The surveying parties being unexpectedly fortunate in finding an abundance of water here, the sierra was called La Laguna (de la Esperanza;) it seems but an eastern branch of the Sierra del Ajo.

Northwest from the Sierra de la Nariz this latter sierra, a bold and high mountain range, is visible. As we have been told, it takes its name, (del Ajo,) garlic, from its structure, appearing as the consolidation of various branches forming a cordillera. Although composed most probably of volcanic rocks, similar to that of ranges just referred to, it is quite different in its other features. As seen from the southwest, a huge central block of metamorphic, or, more probably, igneous rock constitutes the strike side. This block, exhibiting traces of horizontal stratification, is divided into two almost equal parts by a protruding mass of rocks, which, though lithologically almost the same, show a vertical columnar structure instead of a horizontal stratification. On the sides and about the base numerous isolated and volcanic peak

tower up, but they all, undoubtedly, have the same origin. The main body of this sierra, resembling the bulbous head of garlic, has been dignified with the name of that plant. This rather hyperbolic comparison appears somewhat justified, as it refers also to the endogenous

SOUTH SIDE OF THE SIERRA DEL AJO, AND PART OF CIÉNAGA DE SONOYTA.

growth of both the sierra and the garlic. It forms a subdivide, but the separated waters unite before they are lost in the waste of sand along the Gulf coast.

A wide valley spreads out from the west foot of the Sierra del Ajo; being hemmed in on all sides by mountains, and having only one (and that somewhat obstructed) outlet, this is desig-

nated, in Spanish, as a ciénaga. As the sierra heretofore referred to strikes the eye with a dark-brown or even black aspect, on the other hand the sierras southwest, composed of metamorphic crystalline rock, (feldspar prevailing,) meet the view in a robe of glaring white, dazzling under the rays of a Sonorian sun. It is common to the traveller to distinguish these two classes of mountains as the *black* and *white*, so opposite is their general appearance. At the western foot of the Sierra Juchibabi, which bounds the valley on the south and near the old Mission of Sonoyta Chloritic slates and greenstone appear—these are, however, but local. A branch ranging north shows throughout the same light-colored feldspathic crystalline rock. The ridge east of the ciénaga is but a slight swell of the diluvial plains, and affords an open and travelled pass to Presidio de Altar.

Besides numerous deep charcos and even small lagoons in its lower part, this ciénaga is blessed with a small stream fed in its outset by a number of small springs. These springs afford a constant flow of water, which proves their deeply-seated source. The water is clear, of a bluish hue, but warm and slightly brackish. Notwithstanding this permanent supply, the little river of Sonoyta continues but about a mile as a running stream. There was a mission founded here, but it has long since shared the fate of all similar establishments of this desolate and remote region. The inhabitants now consist mainly of Papagos, who have a few miserable huts, and irrigate a small patch of ground.

The Sierra del Ajo, rising up at the northeastern corner of Ciénaga de Sonoyta, is remarkable for establishing, by a natural monument, a true boundary between the coast and the interior. In its northwestern continuation auriferous and argentiferous copper ores abound. The gold and silver product in this location is said to be sufficient to defray all expenses of mining and assaying, leaving the copper a net gain. These mines have been long known to the Papagos and Mexicans, but were not worked for want of capital and security against the Apaches. Some Californians, under the name of "Arizona Company," have now "prospected" the country between Sonoyta and the Gila. They commenced to build roads, make water-tanks, introduce labor, and, notwithstanding these initiatory expenditures, anticipate a prosperous business.

Following the bed of the Sonoyta river, a narrow but smooth pass leads to another ciénaga, which, having but little water, assumes the general aspect of the desert. The course of the Sonoyta river is traceable through it, but the water, except in two or three places, does not come to the surface, and it is necessary to dig for it everywhere during the dry season. Feldspathic crystalline mountains border also the ciénaga except on the west, where the river finds an outlet for the flood of water that may sometimes rush down its usually dry course.

The sierra partakes very decidedly, in its physiographical character, the features of the Great Colorado desert. It is a Papago name, and signifies little mountain gap or pass. Upon some rising ground in the west end of the last-mentioned ciénaga there is a settlement, or, more properly, cattle rancho, the inhabitants of which are favored with spring water flowing out in abundance from a dozen little springs. These springs come out in a line from a considerable bank, which seems to have been formed by sediment, perhaps carbonate of lime, which they themselves have precipitated. The water resembles, both in appearance and mode of issue, that of Sonoyta, and there would be in all probability no error committed in assigning their thermal and mineral properties to a common source. West of Quitobaquita the line passes over a broad ridge dipping east and west before reaching the Cerros de la Salada.

This group, like all the adjoining mountains, consists of crystalline feldspathic rock. The present structure of the Salada hills indicates a general geognostical disturbance of the relative position they must have once sustained. They vary in relative height, and the rocky parts are often covered with debris. The relative position as well as the direction of the sierras between this place and Sonoyta show a deviation from the parallelism so characteristic of north-western Sonora.

The water of the Rio Sonoyta appears above ground for the last time near Quitobaquita. On the southeast side of the Cerros de la Salado fresh palatable water can be got in its bed by digging to a depth of about three feet. Just below, it becomes so salt that even famishing mules will not touch it. This salt water has given its name to the adjoining mountains. From this point southward the country is open, presenting to the view a bold and isolated mountain group at some distance, known as Sierra Pinacate. Its name, signifying beetle, does not seem to have reference to any peculiarity in appearance or formation. In consequence of the entire absence of water, the Sierra Pinacate is almost inaccessible; it is, however, celebrated throughout Sonora for wonderful and inexhaustible layers of rock-salt, which is said to be stored up in immense masses, arranged in diversified strata and of a variety of colors. This Pinacate, in all probability, bears a close geological relationship to the Cerros de la Salada.

West of the Salada hills a wide, waterless desert stretches out, studded with numberless isolated little peaks and a variety of mounds, composed of the crystalline feldspathic rock or igneous masses—the latter is either trapitic, amygdaloid, or porphyritic. Southward, this desert is bounded by low ridges or, rather, gradual risings of the diluvial main; north and west by bold volcanic sierras. A rugged cordillera, known as the Sierra Tule, limits this desert on the west, and breaks off what would be otherwise an uninterrupted continuation of the great Colorado waste.

There are playas near the centre of this desert plain, and sometimes just after a rain charcos of drinkable water. Towards the Sierra del Tule, there is an ascent over an immense bed of dark versicular trap, from which rise small black and white hills or mounds. These gradually increase in size and number in the vicinity of the mountains, and assume an elongated shape, with the usual bearing S.E. and N.W. Finally they unite with the latter, and form spurs of the main mountain mass.—(See outline sketch No. 58, of azimuth line.)

The black and white rocks which constitute this mountain appear in one place closely packed or pressed together; in another they shoot up as separate branches. The dip and strike with the stratification and cleavage are contorted, and in most places entirely obscured; at another

PLUTO-VOLCANIC PEAKS STUDDING THE MAL-PAIS EAST OF THE SIERRA TULE.

place again they are traceable even at a distance of a mile. This is a mountain block—the upheaved corner of a bed of feldspathic syenite or granite changed into granitic lava or regular

trachyte, containing numerous large crystals of glassy feldspar. The singular aspect of this mountain is produced by the protusion of crystalline rocks through a bed of black vesicular trap.

The morphological features of these walls of rock bear a resemblance to the ice formations of the Polar seas. Similar causes have effected similar results; there, we have the consolidation of aqueous masses; here, the crystallization of pluto-volcanic rock. Similar in outline, there are, on the one hand, ice-fields, hummocks, packs, and icebergs; on the other, vast beds of trachytic lava, contorted peaks of porphyritic or amygdaloid rocks, upheaved edges of immense beds of metamorphic masses forced upon each other—broken, crushed, and shattered—and formed over again.

The whole of both the icy and rocky world, each one floating half submerged upon an ocean—the one upon the salt waters, and the other upon the residue of a quaternary sea. The moving medium is also somewhat analogous to the masses acted upon. There are the oscillatory movements of the sea with one, and the folding of the earth's crust with the other.

That metal is to be looked for in mountains like that of Sierra del Tule is doubtful. A piece of copper ore, however, was picked up by one of the party off one of the highest—almost inaccessible—peaks. Our duties were such as would not permit of an examination for ores of any kind; yet had their been any indications of their occurrence—such as oxides and sulphates of copper or lazur and malachite—they would certainly have attracted our attention. (For analysis of piece discovered, see page 25.) This, consisting like the last-mentioned sierra of several ranges, would be more properly called cordillera.

The petrographic features of these sierras are similar, and there is not much doubt but that they originated from a common upheaving focus. This sierra is the last of the ranges traversing the State of Sonora. Westward from its crest a few rocky peaks only are visible, rising out of the diluvial main like out-posted reefs along a seacoast, and are in all probability the tops of submerged sierras. The tinajas altas, or water-holes, in the volcanic crevices of this mountain are famous; they are the principal places in the surrounding country where the traveller between the Colorado and the springs of Sonoyta may expect to find water.

After leaving this sierra, the Colorado desert proper is entered upon, stretching in an unbroken sheet of drifting sand to the foot of the California Cordilleras, a distance of about 130 miles. The distance in a direct line from the Tinajas to the Colorado is about 45 miles; about midway, there is a slight swell of the sand traversing the desert, and which may be considered an underground sierra.

Reviewing the mountain ranges passed over, we find that they invariably dip to the east, with their strike facing west; each sierra and cordillera may, therefore, be considered as one page in the great book of creation. Few of them have been fully opened so as to permit a satisfactory reading of their pages; whilst their greater number still remain closed, with just one edge turned up. Our belief is, that when the time for further revelations come, the axis of disturbance will develop itself in the eastern base of the California Cordilleras, and these mysterious sheets will be turned from west to east.

The sierras Santa Cruz, Pajarito, and Santa Barbara, have disclosed a part of their geological history, while others, especially those on the confines of the desert, have hardly commenced to do so.

Earthquakes are not uncommon in the basin of the California Gulf. There are two solfataras now known at the eastern foot of the south California Cordilleras, both still in activity; and

the lower Colorado is constantly changing not only its bed but also its numerous bends. Below the mouth of the Gila there is but one place where the river remains unchanged, which is so remarkable a fact that the navigators of this river named it the "Permanent Bend."

Considering such facts, we cannot doubt that the regions here spoken of have not yet passed through all the phases of their destiny. We do not, however, believe any general and violent catastrophe indispensable for further geological developments. A long continuance and perhaps imperceptible rising of the country, a simple increase of elevation, and especially an enlargement of the angle of grade by which the horizontalism of the quaternary main would be disturbed, should it become subjected to these forces, would aid the torrents of the mountains and the sweep of ærial currents to clear the surface of the country from its desert burden.

CHAPTER V.

PHYSICAL AND GEOLOGICAL DESCRIPTION OF THE COUNTRY FROM THE INITIAL POINT ON THE PACIFIC TO THE JUNCTION OF THE GILA AND COLORADO.

The data on which these results are based are derived from personal observation and collections continuously made during my stay in that region from July, 1849, to March, 1851. This period was variously occupied in different sections of this region, including an interrupted residence in the vicinity of San Diego; an expedition of three months' continuance to the mouth of the Gila River; a land journey up the Pacific coast as far as Monterey; a residence during the fall and winter months of 1850–'51 at the Mission of San Luis Rey; together with various minor excursions to the mountains east, north and south of San Diego.

The region of country thus covered by my observations includes portions of territory lying between 32° and 36° N. latitude and 114°–121° W. longitude. The district, however, to which my attention was mostly confined is indicated on the accompanying geological map, and popularly known under the title of Southern California.

The separate heads under which I propose to embrace the general information pertaining to the subjects assigned me are—

I.—*The general physical features of country.*
II.—*Geology and mineral productions.*
III.—*Botany.*
IV.—*Agricultural capacities.*

I.—THE GENERAL PHYSICAL FEATURES OF COUNTRY.

The most marked external feature which serves to give character to the region under examination is seen in the occurrence of a mountain range parallel and in close proximity to the ocean, presenting in its various elevations and the differences which characterize its two slopes (eastern and western) a great diversity of scenery within a small compass of territory. The range itself, in its geographic relations, must be regarded only as an inferior link in the great mountain chain extending along the entire northwest coast to the extremity of the California peninsula. To the part at present under consideration the local but not very precise term of the Cordilleras of California has been applied.

Directing our attention to this portion of the mountain range, considered as a whole, it will be remarked that, while the general direction of the range is parallel to the coast, this feature is worked out in detail so variously that it would be difficult, from a single point of view, to decide on the true direction from noting the supposed axis of greatest elevation. This is, perhaps, owing to a peculiar feature of the range, which, instead of consisting of continuous ridges or *sierras*, as they are termed, are made up of an irregular series of rounded or ridge-formed

peaks, sloping gradually towards each longitudinal extreme, with their more or less tapering spurs interlocking with those of adjoining ridges, but scarcely ever in a continuous line.

This view of the range will serve as a useful key to explain many of its peculiarities. Thus, as one fact in connexion with the general features of scenery, it will be noticed, that though the bareness of vegetation would seem to favor extensive views, they are seldom, even from the higher points, of that commanding character such as may serve to give a true idea of the elevation attained, or to strike the mind with those ideas of grandeur elsewhere connected with wide-spread mountain scenery. The horizon is, in fact, shut in, and the view confined to a limited sphere, by the varied direction of these mountain spurs. Roads and passes are also readily found, and routes can be modified with comparative ease by selecting the interlocking spaces to pass from one range to another, or by crossing spurs at their lower depressions.

Another fact connected with this character of the range is a marked tendency in the main valleys to assume a basin shape, apparently encircled by mountains, and fringed on all sides by branch valleys, affording a choice of travelling routes in every direction. We also frequently meet with upland plains of a similar character, where the more extended view takes in distant mountains, in which, though a more determined general direction of the range is apparent, the approach to a basin feature is not lost.

Connected with the same general cause, streams find their way by very devious courses, and on the western slope, particularly, are seldom followed in any direct line of travel.

In reference to the two slopes of this mountain range, an important point connected with their distinct external features is to be noted in the fact that the axis of greatest elevation, or the true divide, is much nearer to the eastern than the western base. Thus, supposing the mountains to have an average width of 60 miles, the centre of this line would invariably fall far on the western slope, the real water-shed being pretty constantly marked within ten miles of the eastern base, thus leaving a proportional difference between the length of the two slopes of five to one at least; hence, as a natural consequence, the eastern slope is more abrupt and precipitous, the western more gradual and circuitous; the streams of the former dash down a limited descent, and are soon lost in the absorbent debris at the base; the streams of the latter, flowing more leisurely, and drawing as tribute in their winding course a more abundant supply, frequently embody sufficient force to reach the ocean.

Confining the attention more closely to the Pacific or western slope, we are led to observe in its wider dimensions that it is made up of quite a number of parallel minor ranges, comprised in the general series, forming intervening depressions, and marked off by spurs, in the above-mentioned basin-shaped valleys; towards the summits these valleys are more contracted in breadth, and attain wider dimensions as you approach the coast. At the higher elevations, the mountain sides are usually bare and rocky, but the immediate summit assumes a more verdant character, being clothed more or less with pine and Alpine oaks. The ranges adjoining the coast are smooth in outline, slope up gradually into vertebrated ridges, and are covered with a dense, brownish shrubbery, giving a singular, smooth aspect to their distant outline. Moisture is more abundant and the streams more copious towards the higher elevations, while the wider coast valleys, unfed by perennial streams, are, during the greater part of the year, destitute of running water, the issue from occasional springs becoming speedily evaporated in the dry atmosphere.

These different ridges vary somewhat in geological structure, and, as we shall have occasion to notice hereafter, serve to give an additional variety to the mountain scenery. However viewed, nakedness is the prevailing character, the exceptions being few and far between.

The summit ridge, attaining a variable height above the sea of 3,000 to 5,000 feet, presents in its wintry covering of snow, and its richer verdancy of summer growth, some of the finer features of California scenery. Without possessing a marked Alpine character, it approaches it in a sparse growth of pines, and other coniferæ; while the frequent fogs bathing its sides favor the growth of lichens and mosses almost unknown in the lower regions, except in a few evanescent forms during the rainy season.

The view to the west takes in the bold outline of treeless ranges stretching in a dim line seaward. Looking towards the east, the less obstructed view traces the line of diminished vegetation, plainly and somewhat abruptly marked, in going downward on the steep slope. Irregular mountain peaks, and ranges of a dull, ashy color stand out in view in close proximity, and below all stretches the brown plains of the desert, extending to the hazy marked line of the Colorado river.

Descending from the summit westward, you pass down luxuriantly grassed valleys, edged with scattering pine and oak groves, and watered by cold, perennial streams, until an abrupt descent to a lower level brings you again into wider basin-shaped valleys, bounded on all sides by rocky ridges. The streams spread out into low grassy or sedgy marshes, and the pine growth gives place to the lowland oak, with its peculiar undergrowth. Continuing thus by a series of gentle swells and abrupt descents, you pass almost insensibly the different ranges, till the smooth, brown outline of the coast range indicates your proximity to the sea.

In the summer season you wind down broad valleys, marked by the dry, pebbly beds of winter streams; herbage is dry and wiry, and water confined to a few willow-shaded marshes or isolated springs. Opening on the sea, you traverse dry moorland hills, dropping down to the sea-level in the bed of some wide, sandy valley, which, with its sides bounded by precipitous walls of coarse sand and pebbles, finally spreads out into wide saline flats, cut up by tide estuaries, and terminates on the ocean beach.

Proceeding from the same summit ridge in the opposite direction (eastward) from its pine fringed heights and rich green sward, you drop by a steep descent into pent-up valleys bounded by ashy-colored mountains. The streams which flow in the upland ravines are soon lost in their thirsty beds. The valleys near their exit from the mountains slope in a regular plane, covered by wide and dry beds of streams. Occasionally the passage of an irregular mountain chain is marked by a rude defile, cutting through mica slate, or highly micaceous granite. Thus winding with occasional passages over ridges of the same character, flanked with rough pebbles, the desert opens before you, its table-land being generally gained by a steep ascent from the deep bed of some dried up stream, along the course of which the geological tertiary formation is strongly marked in thick layers of marl or sand, surmounted by a varying bed of rounded pebbles.

Over the desert waste, furrowed occasionally by the dry sandy beds of rain streams, you pass insensibly down till the lake formation of "New River" comes into view. Here the soil acquires a sedimentary character; fresh-water shells are scattered here and there. The immediate lake edges and lower depressions are bordered by a growth of mezquite, while, in its

proper season, large patches of *annual grama grass* relieves the desert of its barren aspect, and transfers the mind to scenes of neatly trimmed pleasure grounds set off with verdant shrubbery.

The next stretch mounts again to the pebbly strewn table-land of the desert, from which you descend further by the steep sandy bluff which bounds the bottom land of the Colorado river.

STREAMS AND WATER-COURSES.

A consideration of the character of the various streams and water-courses in this region belongs properly to the view of its external features, and derives especial interest from the intimate relations they sustain to climate and agricultural resources. On the western slope the various streams, each draining a very limited area, are remarkable more for their number than their magnitude. Having their main sources near the mountain summit, they pursue their tortuous course towards the sea, following all the irregularities interspersed by the separate mountain ranges and their projecting spurs. By these devious courses the descent is finally accomplished without occasioning falls or cascades, which are so commonly associated with mountain streams elsewhere.

Their volume being necessarily dependent on the supply from local rains, they generally attain their greatest bulk towards the close of the rainy season, when the melting snows at their sources combine with frequent showers below to swell their volume. As the dry season advances they gradually contract their dimensions, till in the month of July most of the streams near their mouth become absorbed in their porous sandy beds. The exception to this general fact is seen only in those streams which, having their sources in the higher mountain ridges, receive a sufficiently constant supply to exceed the amount lost by evaporation.

The drying up of the stream beds is a gradual process, necessarily modified by the comparative dryness of the atmosphere, as also by the relative absorbent or retentive character of their beds.

The point at which water ceases to flow is quite variable; its more usual upward limit being marked at or near the passage of the stream from the first rocky ranges into the Tertiary formation. The point, however, as before stated, is by no means a fixed one; thus, during the night it extends further downwards than in the daytime; in cloudy weather, for the same reason, its course is more prolonged than under a clear sky. In the stream beds themselves, however dry, water is generally found a short distance below the surface.

The descent of these streams in the rainy season may be either a gradual process in the progressive saturation of their sandy beds, or the saturation being accomplished by previous showers, the irruption may be sudden. A fine example of this sudden appearance was observed in the San Diego river, in December, 1849; when, after a rainy night, by which its sandy bed was completely saturated, the upper stream suddenly appeared in the form of a foaming body of water, moving onward at the rate of a fast walk, curling round the river bends, absorbing the pools, and soon filling its shallow bed with a brimming swift current.

An instance of the more gradual descent was seen on the following season, December, 1850, when, from the absence of local rain, its downward progress was slow and interrupted.

The facts connected with this supply of running water seems to deserve particular attention in this region, where its presence or absence is synonomous with barrenness or fertility.

The streams of southern California are, in truth, the life-blood of its agriculture, and the means to be adopted to extend this supply can only be efficiently based on a clear understanding of all their separate relations, both as to atmospheric conditions and geological structure. In many of the old mission establishments extensive lines of masonry were constructed, by means of which the streams were tapped a short distance above their place of sinking, and a vigorous irrigating supply conveyed to the lower portions of the valley, thus rendering productive lands otherwise useless for all the common purposes of cultivation.

It is therefore in the true character of these streams—with reference to their sources, their beds, the elevation and geological structure of their banks and bottoms—that we are to look for the fairest general idea of the agricultural capacities of this region.

But it must further be remarked that it is not to these mountain sources alone that we must look for the needful supply of water; occasional springs in the lowest portions of valleys frequently furnish a constant flow sufficient to meet the demands of cultivation over a limited area.

Thus, the extensive mission of San Luis Rey, proverbial for its vertility, depended almost entirely upon such sources of supply. Similar examples in other parts, though rare, may furnish useful indication, in directing the location of artificial means of supply, by the construction of Artesian wells.

Referring to the character of the streams on the eastern mountain slope, we have before noticed their abruptness, also the rapid diminution of volume which they undergo in their steep descent. The excessive dryness of the atmosphere, and the more absorbent character of the strata through which they pass, serves to exaggerate all their peculiarities, as compared with the opposite slope. The streams, equally as vigorous at their sources as those of the other slope, are quickly absorbed in their course, and none at any time acquire sufficient volume to be entitled to the name of river affluents. Thus, though the existence of wide and deeply cut stream beds show the occasional agency of powerful streams, derived from the rapidly embodied force of copious rains, yet their rare occurrence and short continuance only serve, in the main, to give an exaggerated feature of barrenness and desolation to a region where, during the greater part of the year, scanty supplies of water are only attainable from stinted and unwholesome springs.

The point at which water ceases to flow is extremely variable, and exhibits a singular intermittent character: thus, in the morning you may cross over quite a large brook, and at the same place, by noon, find it entirely dried up, to show itself again when the diminished evaporation, at night, allows the ground, instead of the atmosphere, to receive its aqueous tribute. Often you meet with streams, near the lower mountain slope, present at one point of their course and absent at another, thus constantly varying, according to the relative absorbent or retentive character of their beds.

On the desert plains, the stream courses are marked by wide beds, with more or less abrupt banks, cutting through strata of sand, marl, or coarse gravel. Near the mountain base they exhibit steeply inclined plains, strewn with a variety of rounded and angular pebbles.

In the re-entering angles, formed by the irregular projection of mountain spurs, these plains often attain an elevation of nearly one-half the mountain height, and are taken advantage of in the selection of passes.

But the point of all others which has attracted most attention, in reference to the distribution

of water on this desert plain, is to be noted in that singular feature, to which the name of "New River" has been applied by the Californian emigrants.

The idea naturally conveyed by this name is that of a running stream, arising in the desert and flowing towards the Colorado river, but its true character is quite the reverse; the current itself, which is by no means constant and at all times irregular, is in the opposite direction, or from the Colorado, while its bed, instead of exhibiting the features of a regularly washed stream bank, shows only a chain of lagoons or marshes irregularly connected, and often spreading over extensive tracts, or at other times contracted within narrow beds. Its novelty, moreover, is sufficiently disproved by the presence of heavy mezquite growth, and other plants and shrubbery usually associated with the presence of water in this region. Indeed, all the singular features in the case are now sufficiently accounted for, in the ascertained fact (first suggested by Major Emory from barometric observations) of the existence of a natural depression, at this point, below the level of the Colorado river at high water. The connexion between the overflow of the one and the appearance of the other has been frequently observed, though the exact course of this connexion has not yet been traced out. Still, all the facts in the case derive their full explanation by referring it to this peculiarity of the Colorado river, which, seeking an outlet for its swollen waters, spreads them in fertilizing deposits to such a great distance from its usual bed.

LAKES AND LAGOONS.

Mountain lakes are of very rare occurrence in any part of the region under examination. The only body of water that I am acquainted with really deserving the name of a lake, is found on the western slope of the mountains, near the parallel of 33° 30′ north latitude, and some twenty-five miles distant from the ocean. It is about five miles long, by from two to four in breadth. It has no outlet, and its waters are consequently brackish. It is also apparently shallow, and exhibits along its banks marks of recent and continuous recession, plainly indicating a gradual exsiccating process. What adds to the interest of this latter fact, is the explanation it seems to offer of the original condition of some of the more fertile basin valleys, which exhibit all the characters of a lacustrine origin, to which they now owe, in a great measure, their fertility. A fine example of this may be noticed in the rich and extensive valley known as the San Bernardino. It is seen encircled by high mountains on all sides, and seems to have derived its subsequent drainage by the Santa Anna river, which is now observed passing through an elevated range of tertiary mountains towards the ocean.

On the desert plain of the eastern side of the mountains, report speaks of one or more extensive salt lakes, but no opportunity was afforded for a personal examination of their true character or extent. The fresh water lakes and lagoons belong to the "New River" formation, which has been sufficiently noticed above.

II.—GEOLOGY AND MINERAL PRODUCTIONS.

Directing the attention more especially to the geological structure of this region, we have to consider the same mountain range, in its line of greatest elevation, constituting a central axis from which we may trace on each side the diversities that characterize its extended flanks.

By reference to the accompanying geological map and sections, *three* main facts will particu-

larly claim our attention, and serve at the same time as the most natural division by which to unfold the entire subject.

1st. The great preponderance of crystalline metamorphic granite pertaining to the older paleozoic series of rocks.

2d. The entire absence of any member of the lower paleozoic, or secondary rocks, in their regular stratified character.

3d. The existence of extensive Tertiary deposits, forming a more or less extended flank, on each side of the m untain range.

1st. In reference to the preponderating granite formation, as exhibited in the central axis, and main development of the mountain range, we shall notice a considerable diversity of form and structure, but all evidently pertaining to the same general formation of metamorphic rocks in their different exposures. Illustrative specimens are characterized by Professor Hall in the accompanying list, to which reference may be had for special characters.

The central axis is represented by a somewhat variable mottled granite, composed of various proportions of *quartz*, *feldspar*, *mica*, and *hornblende*, frequently containing imbedded crystals of *tourmaline*. The exposed mass varies greatly in the degree of aggregation of its component materials, assuming in some places a close sienitic texture, while in others a larger proportion of feldspar renders it more readily decomposable by disintegrating causes—its exposed face easily crumbling into a coarse, granitic sand.

At other points the preponderance of mica, confusedly mixed in large scales, serves to give a very irregular form to the external rock exposures.

Belonging also to the same series, we find, particularly on the eastern side of the range, mica and talcose slates associated with quartz veins.

The irregular rocky range immediately adjoining the coast, and also probably composing the numerous rocky islands extending at variable distances seaward along the same line from northwest to southeast, present a distinct form of eruptive rock, described by Professor Hall as "*greenstone, with soft chloritic spots, or blotches*," and "*porphyry*, or *porphyritic greenstone*." This character of rock forms the first extensive range of mountains east of San Diego Bay, and attains an elevation in some of the higher peaks of 2,500 feet above the sea.

Further to the north, in the vicinity of San Luis Rey, several isolated peaks exhibit a basaltic structure, weathering into peaked domes, with abrupt columnar faces. Professor Hall considers all the rocks of this series as of quite recent origin, compared with the central granite series above mentioned. As sustaining this view, we observe further north, in continuation of this range, near Santa Barbara, evidences of disturbed Tertiary rocks associated with similar or more recent igneous exposures.

The isolated mountain peaks and ranges adjoining the Colorado River exhibit a sienitic texture, which, by exposure to the dry atmosphere, acquires a deep brown, polished face, giving a peculiar and forbidding aspect to the bare mountain scenery.

These sienitic rocks are frequently associated with gneiss, exhibiting a very distinct stratified character, occupying a position external to the adjacent igneous rocks.

The immediate junction of the Gila and Colorado Rivers is marked by a singular geological formation. It is composed of an irregular series of rounded knolls, attaining a height of thirty to eighty feet above the river level.

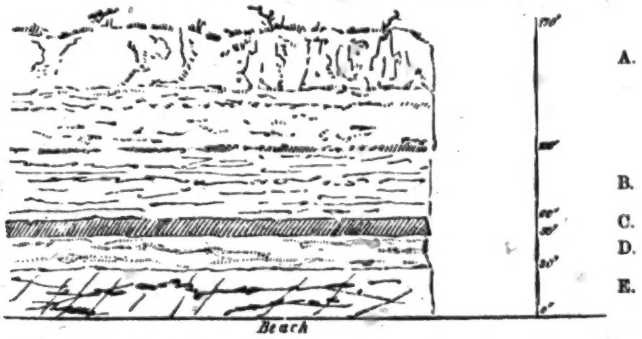
The summit and sides of these knolls are strewn over with the erratic fragments which pertain to the continuous desert formation, and which conceal the central nucleus, except in the deep cleft made by the passage of the Colorado just below its junction with the Gila. At this point we see the central nucleus forming an irregular breccia, composed of variously sized blocks, frequently massive. The rock is a form of greenstone, streaked with epidote. The cementing material is apparently derived from the natural decomposition of the contained rock. On the western side, near the level of low water, there is an underneath exposure of a dark-colored mass, composed of epidote, with talc—the latter being occasionally granular. This material is seen shooting upward into the superincumbent breccia in the form of veins, and would seem to hold some close relation with the disturbing cause below.

The external features of this singular formation we have endeavored to represent in sectional sketches.—(See part 1, pages 128, 129.)

The Tertiary formation.—The Tertiary formation which flanks the mountain range on the west extends to the Pacific coast, forming a belt of variable extent and thickness, and composed of various stratified deposits.

The strata adjoining the sea occasionally presents abrupt ocean bluffs, washed by the waves at high tide; through the same formation the various streams cut their way, forming deeply trenched valleys. The strata thus exposed in the sides of valleys exhibit a slight dip toward the sea, and are seen to be composed of alternate beds of coarse sand, clay, or marl, with occasional beds of interstratified pebbles, all smoothly rounded, and variable in size.

SECTION OF LIGNITE BLUFF NEAR SAN DIEGO.



A. Coarse, feruginous sand, with occasional interstratified pebbles, weathering very irregularly into fantastic shapes, forming miniature peaks and ridges.

B. Coarse, white sand, in even, horizontal strata.

C. Drab-colored sandstone.

D. Fine-grained sand, varying in color from buff to light-gray, containing thin seams of sulphuret of iron.

E. Tough clay, containing an irregular seam of lignite, with smaller portions of mineralized bitumen.

In the vicinity of San Diego, and plainly exposed in the steep bluffs which bound the lower part of the river valley at this place, is observed a distinct fossiliferous layer, having a thickness of about thirty feet. Its lower members, resting on micaceous sand or clay, are not more than twenty feet above the present sea level.

The contained fossils are made up mainly of silicified casts of marine shells, imbedded in a calcareous medium of more or less close texture. The individual forms of fossil species are quite numerous, though the number of distinct species is not great; the most abundant and widely spread is a species of *Turritella*.—(See Plate No. XIX, fig. 8.)

This formation is distinctly traceable at various points up the coast, and in the neighborhood of Santa Barbara is seen to form mountain masses. Wherever noticed, it is overlaid by various sandy layers, forming an upper capping of very variable thickness.

The irregular layer of interstratified pebbles, so frequently seen in hill-sides, seems hardly capable of being referred to any distinct place in the general Tertiary series. Their most abundant occurrence, however, near the mouths of valleys opening on the sea, sufficiently indicate that they are derived from the combined agency of river transportation and tide-washing—having attained their present position by subsequent land elevations.

The junction of this Tertiary formation with the adjoining granite or igneous rocks is seen in a general thinning out of the former, which, at last, barely mantling the protruding rocks, is blended with the result of present decomposing agencies.

Natural terraces and table summits.—Another interesting geological feature, observable in the post Tertiary strata adjoining the coast, is the existence of natural terraces and table summits, of various elevations, and their evident connexion with ancient sea levels—thus indicating successive periods of land elevations.

A series of at least three of these terraces is distinctly noticeable near the initial point of boundary on the Pacific.

The highest of these is exhibited in that striking landmark appropriately named "Table Mountain." Visible, far out at sea, and attaining an elevation of not less than one thousand feet above the present sea level, it presents a distinct outline of abrupt slopes terminated by a regular flat table summit. As it now stands in its isolated character, and not far from the sea beach, it appears to be altogether unique, though, doubtless, more extended and accurate observation of height and situation would show its connexion with some of the higher terraced elevations adjoining the interior mountain slopes.

The next step in the descending series is represented in the average level of the post Tertiary bluffs and hills near the coast, say at a present elevation of two hundred to four hundred feet above the sea. The irregular character of the deposit, at various points, and the evidence of long-continued denuding influences, have necessarily obscured the general level; or, as we may suppose, the land elevation at this period was itself irregular or alternating with periods of depression. It may further be remarked, as substantiating this latter view, that the deposits here exhibited are those most abundantly characterized by the presence of transported rounded pebbles, irregularly distributed, as we have seen, along the course of valleys of denudation.

The third well marked terrace formation in the descending, or more recent series, occurs in close proximity to the present sea beach, and is characterized by a more alluvial deposit, and also the first appearance of recent marine shells, strewn irregularly over its surface in comminuted fragments. A fine example of this formation is met with where the initial point of boundary on the Pacific is marked by the first monument. Attaining an elevation of forty to fifty feet above present tide water, it presents a steep slope seaward, and extends in quite a regular terrace to the adjoining broken hills, before noticed, as constituting the middle terrace formation.

This last step in the series presents in its organic remains, and more alluvial character, an approach to the present alluvial tracts of this region.

Further north, where, from the western bend of the coast the Tertiary belt acquires its

broadest dimensions, we have apparently the formation last considered represented in those extensive plains which, extending inland from the sea often several leagues, give character to that section of country by increasing its agricultural capacity.

The commencement of these plains on the south may be seen, by reference to the map, to correspond with the greater development of the Tertiary formation, both in extent and thickness.

Thus to the N.E. of San Juan Capistrano the Tertiary deposits form an elevated mountain range, attaining a height of two thousand feet or more above the sea. Here, also, are exhibited the first signs of internal disturbance in abrupt and variable inclinations of the Tertiary strata.

As the necessary result of all these conditions we have a more abundant supply of material, under the natural denuding influences, for the formation of the lower terraces, or the plains, under consideration.

Some of these plains, encircled by higher Tertiary hills, represent in outline beds of extensive sea bays, of a previous era, now, by the elevating agencies at work, converted into their more attractive land features. A fine example of this latter fact may be noticed on the accompanying map as the "Santa Anna Plain."

Desert formation.—The corresponding Tertiary formation on the eastern side of the mountains must now claim our attention. And first, it will be remarked, in contrast with what we have noticed on the opposite Pacific slope, that the line of junction between the crystaline rock and the Tertiary belt is more distinctly marked.

The character is well exhibited where the stream courses from the mountains enter the Desert plains. They are there seen cutting their way through the Tertiary strata and presenting deep vertical sections of their stratified deposits, consisting of marls, sands, and clays, with a very constant accompaniment of stratified pebbles, the latter of greater or lesser thickness, and forming the most usual upper capping, which constitutes the table summit of the Desert plateau.

It is in the marl and clay deposits that gypsum makes its appearance, being frequently washed out along the edges of the steep bluffs in the form of shining flakes of selenite. Here, also, occur the first marine fossils found to characterize the formation, including species of ostrea.

This marl formation, thinning out to the eastward, gives place to coarse sandy layers of great thickness; thence forming the exclusive substratum of the desert, and extending to the table bluffs, which bound the alluvial bottom of the Colorado river. In this last situation it exhibits a perpendicular wall 60 feet or more in height, overlaid by pebbly deposits, having an average thickness of 20 feet, more or less. These pebble deposits are in this situation frequently cemented by a calcareous medium more or less compact, and occasionally forming a close cretaceous conglomerate.

It is in the geological features thus sketched that we can best indicate the true desert character of this region, covering a vast extent of country, and forming the plateau through which all the rivers of this region take their course. Its deep porous layers rapidly absorbing the waters of occasional heavy showers by which it is visited in the latter summer months, it spreads forth at other times an arid waste often under a burning sun. The wonder is that vegetation in any of its forms can procure the elements for a stinted growth.

The further relation of these strata to the supply of water for the use of travellers is of great

importance, and may be briefly alluded to here. It was formerly supposed that no natural reservoirs of fresh water sufficient for the supply of men and animals existed over the entire distance of 80 miles, from the mountain base to the Colorado river. The subsequent discovery of extensive depressed areas, as that constituting "New River," retentive both of rain water and river overflows, has materially shortened these "dry stretches," as they are termed, especially in certain seasons. Due to the same general cause, depressed areas, that have no connexion with flowing water, are the salt lakes of greater or less extent; the degree of saline impregnation necessarily varying according to the amount of aqueous supplies from local rains. The water, however, is rarely, if ever, suitable for drinking purposes.

Even on the higher upland plateaus water is occasionally found in the beds of shallow streams, where the product of recent rains is retained by a clay substratum, the upper sandy layers serving to check the evaporation; but such uncertain sources cannot, of course, be safely depended on during the greater part of the year.

The practical question arises, whether permanent water can be obtained by piercing the coarse sandy layers to a sufficient depth to reach a still lower impervious stratum? As bearing on this question we may cite the irregular character of the argillaceous beds, as seen in various exposures of the lower strata. This irregularity of strata indicates the great probability of finding lower basins of water of considerable extent and capacity connected with sources of supply sufficiently elevated to flow over the surface at the point of excavation.

Still another important question would come up, whether the water reached by permeating through such a depth of saline soil would not be so much impregnated with saline matters as to be unfit for use? But these are questions to be determined by direct experiment, and not by theory.

The "New River" formation, in a geological point of view, must, as we have before remarked, be regarded only as a natural depression in the tertiary series, having a direct connexion with the flowing water of the Colorado river. Its original lacustrine character is sufficiently seen and limited by the presence of fossil fresh water shells, including species identical with those now found living in lagoons adjoining the Colorado. Among these we notice *Planorbis*, *Physa*, *Anandorita;* and besides these a small univalve near *Ressoa*, quite abundantly scattered, and often drifting in small heaps over the alluvial sandy tracts which adjoin the lower depressions.

The further relation of these facts to vegetation and agricultural capacity will be alluded to elsewhere.

MINERAL PRODUCTIONS OF SOUTHERN CALIFORNIA.

The inferences to be drawn from the above geological sketch, as regards the actual or prospective mineral products of this region, may here be properly summed up, following out the same general order as before laid down.

1st. The preponderance of the crystalline granite rocks, constituting, as we have seen, the great body of this mountain range, is unfavorable to the existence of extensive or valuable mineral products. Neither does this view seem at present likely to prove erroneous by the recent impulse given to mineral discoveries on this coast.

Many persons, arguing solely from the general similarity of features between certain sections

in this region and the gold district to the north, have supposed that an equally diligent search here would yield a like reward to the explorer.

Nothing, however, has yet been brought to light to substantiate this view. The washing of the different stream beds only shows the existence of iron in the form of black sand, and no traces, or very indifferent ones, of the precious metals. This absence of metals we should naturally expect where the crystaline rocks prevail. It is on the eastern slope of the mountains, where talcose slate makes its appearance, with accompanying quartz veins, that we have most reason to expect a correspondence with the gold district of the north. Still no discoveries have as yet, pointed to any valuable result; the quartz veins examined exhibit a very uniform thickness of about 12 inches, and maintain a direction nearly north and south, without showing any disposition to form branches; all of which circumstances must be considered as unfavorable to mineral productions.

It must be left to future exploration to determine the true value to be given to the mineral indications of this district.

The often reported rumors of rich copper deposits in the vicinity of San Diego I have not been able to trace satisfactorily to but one certain source. This locality occurs at some distance south of the boundary line, near the Rancho Guadalupe. The spot itself I have never visited; but authentic specimens shown me exhibit a moderately rich copper ore, composed mainly of *green malachite*.

Such a class of minerals we may reasonably expect to find in connexion with the extensive range of greenstone porphyry adjoining the coast.

There is no satisfactory evidence of the existence of silver ore, or of quick-silver, in the district under examination.

2. The entire absence in this region of any of the forms of stratified rocks comprised in the older paleozoic or secondary period, serves to limit still further the prospective mineral wealth of this district. It excludes at once the idea, which has frequently been in vogue, of the existence of *coal* belonging to the carboniferous period. All the rumored reports of its discovery which I have been able to trace are referrible to certain forms of tourmaline, or more commonly to the existence of lignite or *mineral asphaltum*, so generally associated with the tertiary strata.

3. The mineral products pertaining to the tertiary formation worthy of special notice are but few. On the Pacific coast we have to include the various forms of mineral bitumen, a form of *Tertiary chalk*, together with various other *alkaline earths*.

The mineral bitumen is quite extensively scattered over a large portion of the Tertiary district. It occurs in most abundance where this formation acquires its broadest and thickest dimensions, and is connected more or less with igneous disturbance. In the neighborhood of Los Angeles it occurs in the form of what are popularly termed "pitch springs." In such localities, it is observed issuing in the form of a tarry liquid, becoming hard and of a deeper color by exposure to the air. In this latter form it resembles closely the pitch of commerce, and is applicable to similar uses. In the vicinity of San Diego it is found in the form of irregular patches, spattered over the sand rock, washed by high tide. It is also frequently met with in an erratic form, being silted up by the waves at various points along the ocean beach.

The more abundant product of the bitumen springs, in the vicinity of Los Angeles, is principally in use for the sheathing of roofs, as a protection from rain. In the rough state in

which it is employed, however, it has little to recommend it on the score of neatness, presenting under a hot sun a constant dripping from the eaves, disagreeable to the smell, and disastrous in its effects on broadcloth and beaver. At the same time, becoming thin, it requires frequent re-application, and in the cold rainy season is liable to crack, giving rise to sudden leaks. An improvement in these respects might doubtlessly be made, by forming a mixture with some other material, which may serve to add to its solidity without impairing its useful retentive properties. The material might also be used in many places in the construction of aqueous reservoirs, for retaining the product of rains during the wet season. These being located at sufficient height to serve the purposes of irrigation, might thus be made the means of redeeming valuable tracts of land from sterility.

Still further, as an ingredient in the manufacture of sun-dried brick, it promises to come into extensive use, furnishing, at the same time, an almost imperishable article, and admitting of extended useful application in the construction of buildings and fences, with a great saving of bulk of material as compared with the old fashioned "adobe."

In collecting this mineral bitumen for the uses above enumerated, pits of greater or less depth are sunk in the vicinity of the bitumen springs, to which the issue is conducted. This becoming hardened by exposure to the atmosphere, acquires sufficient solidity in cold weather to render it fit for transportation.

Connected, probably, with the same bituminous formation, we find frequently exposed in the sides of ocean bluffs irregular seams of lignite associated with the sands and clays of the Tertiary deposites.

The purer forms of this mineral, at times, closely resemble in external character the bitumens above mentioned, though having a more distinct mineralized structure. It is usually associated with clayey shales more or less bituminous, and frequently marked with obscure vegetable impressions. Fossil remains of lizard's teeth are also, according to the examination of Dr. J. L. Le Conte, found associated with this formation. The lignite never shows itself in any abundance, and neither the article itself or the character of the strata would warrant us in regarding it of any economical importance.

It is to this source that most of the reports of the existence of coal in the vicinity of San Diego have been referred; a brief statement of the above facts is sufficient to show their unfounded character.

The general appearance of this lignite formation, in reference to the commonly associated strata and their comparative thickness, is represented in the accompanying sectional sketch of *Lignite bluff*, as seen at the mouth of Solidad valley, above San Diego.—(See section, fig. 162.)

A third mineral product pertaining to the Tertiary formation, on the coast, is "a highly aggregated calcareous deposit, resembling chalk;" this article is found not generally distributed, but in irregular beds, sometimes of considerable thickness. In the absence of all other limestone materials, it is used for conversion into a weak form of quick-lime; and it is also from some other associated alkaline properties employed in the making of soap.

In the tertiary formation on the eastern side of the main mountain range, the only mineral productions worthy of note are gypsum and common salt. The former is quite abundantly exposed in the marl strata, near the mountain base, where it may probably be found to form

extensive beds. In its present inaccessible position it gives little prospect of being sought or applied to any useful purpose.

Common salt, as before stated, is found along the edges of salt lakes on the Desert. In these situations it is said to be procured with ease by superficial digging, and of very pure quality.

For more detailed information in reference to the mineralogical character of the prevaling rocks and earthy deposits, reference may be had to the list of geological specimens, prepared by Professor Hall, of Albany, New York, which will be found in his report.

The geographical boundaries of the various formations, with their relative developments, are indicated in the accompanying map and sections.

NOTE BY W. H. E.

Assistant Arthur Schott passed over the tract of country described in Chapter V. His geological view of it is so similar that I do not consider it necessary to publish it; but I give an extract from his report, which contains some interesting facts in reference to the changes which have taken place in the Great Desert within the historical period, and some general views, which I think are sound, and are applicable not only to the Desert where it is crossed by the Mexican boundary line, but that vast region of desert country which lies to the north of the line, and which spreads out and probably attains its greatest breadth in the region of the Salt Lake.

Whatever may be the opinions of persons interested in the more northern lines of travel and projected railway routes to the Pacific, we cannot shut our eyes to the existence of this Desert on any line of travel south of the South Pass, in north latitude 42°. I am also of the opinion that this Desert, within the limits of the United States, is narrower and more easily passed over by a railway immediately north of the Mexican boundary than on any parallel to the north of it. An attentive perusal of the report of Governor Stevens will show that even north of the South Pass vast tracts of arid and desert regions were encountered in the same longitudinal zone, which, added to the rigors of the climate, form an almost insurmountable barrier to the project of opening through those regions any great highway of travel, either by railway or wagon road, between the Atlantic and Pacific States.

The full power of the government has been directed towards establishing posts and opening these northern lines of travel; yet we have, within the last few months, seen Fort Laramie, Fort Pierre, and, I believe, even Fort Kearny abandoned by the government, owing to the absolute sterility of the soil, and the impossibility of inducing settlements, or raising even vegetables necessary for the use of the troops.

The records of the Quartermaster General's office show the long continued efforts which the government have made to establish these posts as *nuclei* for settlers, and the utter failure to induce settlement, and make the surrounding country at all conducive to the support of the troops. The idea of carving out States from that portion of the American continent between parallels 35° and 47° and the 100th meridian of longitude and the crest of the Sierra Madre is a chimera. The example of the Mormons is often cited to prove the capacity of the country to sustain population. They occupy an oasis in this great Desert, and their power to sustain even the population they have is by no means established beyond a doubt. On two occasions the grasshoppers were very nearly eating them out and producing a famine; and I am very sure, if it were not for their peculiar institutions, which cannot bear the light of civilization, they could not be induced to remain in their isolated and desert home.

We learn from the report of Captain Beckwith, United States army, how very circumscribed is the area of land which is now susceptible of cultivation in the Desert, and the fact that families sometimes go a great distance from the settlements for the advantage of obtaining a few acres of ground susceptible of cultivation. (See page 65, vol. I, Pacific Railroad Report.) When the truth comes to be admitted, I think it will be found that the upper valley of the Rio Bravo, embracing New Mexico and a small portion of western Texas, is the only tract of land, within the limits mentioned in the preceding paragraph, where a body of land is to be found susceptible of sustaining any considerable population. And yet we see, since our occupation of that Territory, in 1846, the population has increased but little, if at all.

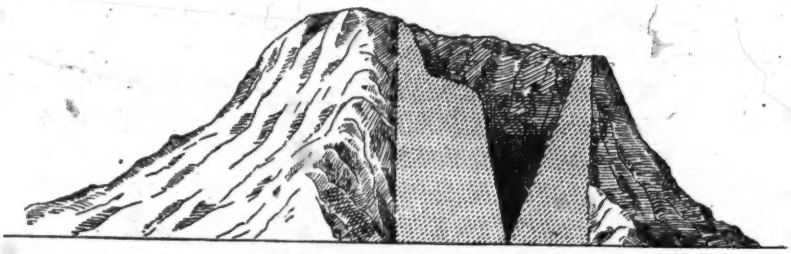
[EXTRACT FROM REPORT OF ASSISTANT ARTHUR SCHOTT.]

TERTIARY SHORE OF THE DESERT.

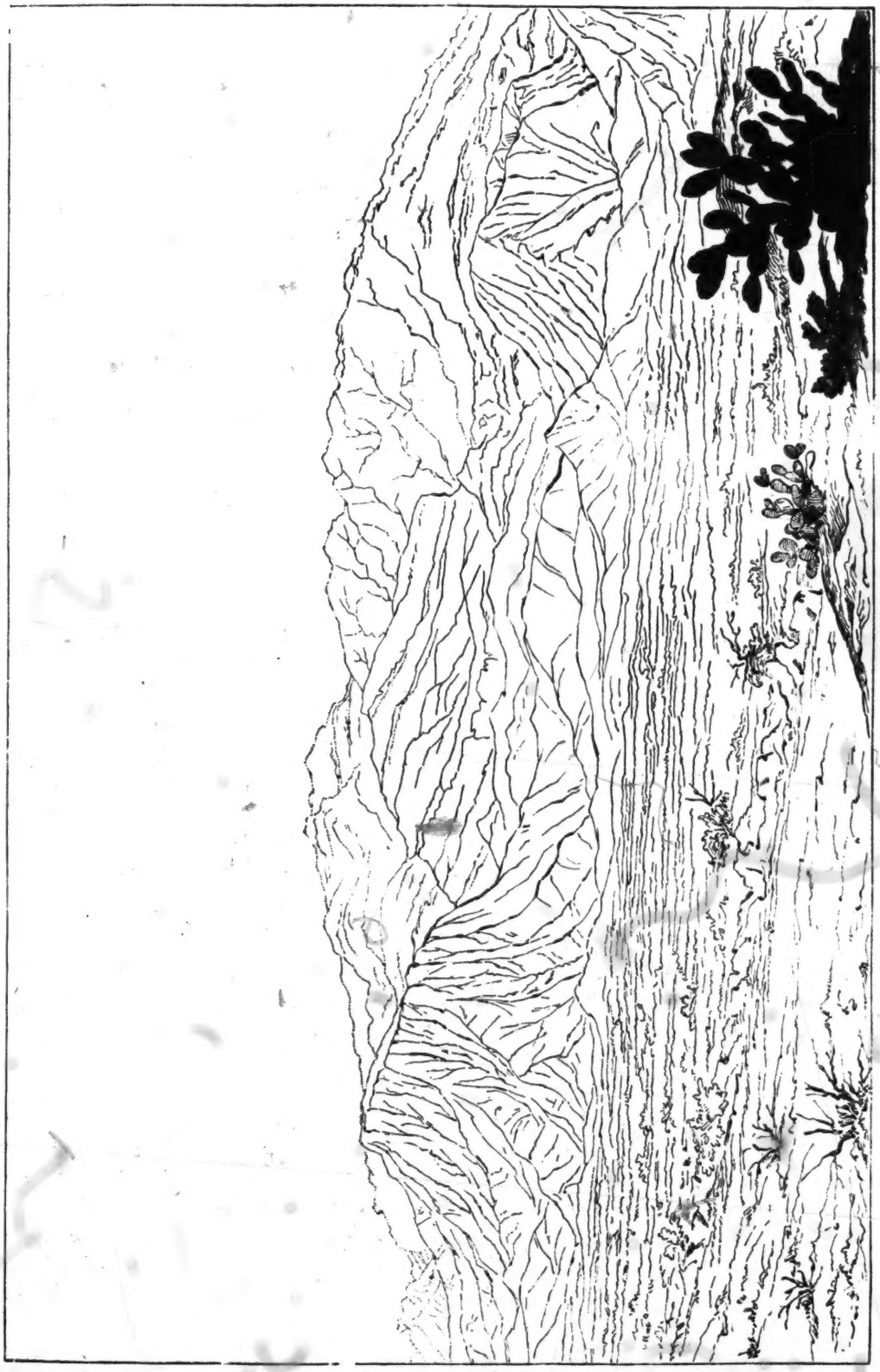
Vallecito, another small Indian settlement in a valley with a number of brackish springs, and abounding in saline soil, is situated on the upper edge of the Desert shore. From Vallecito the road continues along the dry bed of a mountain torrent, deeply filled in with shifting sand. This sand stream seems to form one of the heads of Carrizo Creek, and winds through dreary flats, flanked on both sides by the naked, desolate slopes of the primary and metamorphic mountains. The latter finally cease, and Tertiary ridges, supported by dark masses of eruptive rocks, take their place. These form the real edge of the Desert ocean, which, no doubt, was once the bottom of a wide salt-water basin. The washing of tidal oscillations upon this bold shore caused, probably, the dune-like deposition of the Tertiary hills along the foot of the western Cordilleras. To confirm this supposition of their origin, an isolated group of seabeach-loving palms appear to the left of the road, near Carrizo Creek, marking, at the same time, a spot with permanent water. A brief but graphic description of those Tertiary ridges and hillocks has been brought before the public in Major Emory's report of 1848.—(See page 103.) A sketch of these hills is herewith given.

VOLCANIC VENTS.

Among the Tertiary ridges and hillocks, one may be recognized at once by its singular shape, appearing to be the vent of some volcanic activity now silenced. Major Emory, according to our knowledge, set forth, prior to any other writer, the supposition of the true nature of these hills. After close examination we are able to corroborate the correctness of that supposition. Another not less convincing proof of its neptuno-volcanic origin may be sought in its geographical position, which is upon that long volcanic seam, running north and south, and lining the eastern base of the Peninsular Cordilleras, parts of which are still in activity.



VERTICAL SECTION OF AN EXTINCT CRATER IN THE TERTIARY FORMATION, BORDERING THE EAST SLOPE OF THE CALIFORNIAN CORDILLERAS.



VIEW UPON THE EASTERN SLOPE OF THE CALIFORNIAN CORDILLERAS FROM NEAR CARRIZO CREEK.

SOLFATARAS.

Some volcanic mud springs or solfataras, to the north, in the Colorado Desert, have been visited by Dr. J. Le Conte, of Philadelphia, in company with Major Heintzelman, U. S. A., then commanding officer at Fort Yuma. The former gives an interesting account of his visit there in Silliman's Journal, vol. xix, second series, No. 55, January, 1855. The existence of these springs, however, was not altogether a new discovery of this party, but was well known before to the natives of the country, who resorted to this locality for their annual supply of salt.

The other springs, southeast from Carrizo Creek, and not more than twenty miles from the lower Colorado, were visited also, in 1853, by the same officer, accompanied by a small party. The time this officer had chosen for his trip was about three months after a severe shock of an earthquake, which had terrified the inhabitants of those regions on the 29th November, 1852.

We are indebted to the liberal kindness of Major J. H. Thomas, the successor of Major Heintzelman, in command of Fort Yuma, for a glance at the manuscripts of the latter. The description of the springs and what was known is, in substance, as follows: "There exists, about forty-five miles below Fort Yuma, in the Desert between the western Cordilleras and the Colorado, a pond, considered as an old orifice, which had been closed for several years." "The first shock of an earthquake, in 1852, caused there a mighty explosion. The steam rose a beautiful snowy jet more than 1,000 high into the air, where it spread high above the mountains, gradually disappearing as a white cloud.

"This phenomenon repeated itself several times in a diminishing scale. Three months later I visited the place; jets took place at irregular intervals, from fifteen to twenty minutes. The effect was beautiful, as they rose mingled with the black mud of the pond. The temperature of the water in the principal pond was 118° Fahr., in the smaller one 135° Fahr., and in one of the mud holes, from which gases escaped, 170° Fahr. The air which escaped was full of sulphurated hydrogen, and in the crevices crystals of yellow sulphur were found. The ground near about was covered with a white efflorescence, tinged with red and yellow. On the edge of a small pond crystals of sal ammonia, 1 to 5 inches long, were collected."

CLAVIJERO'S ACCOUNTS OF LOWER CALIFORNIA.

Other important data bearing upon the geology of Lower California have been brought before the public a long time ago by Clavijero, one of the missionaries in the southern part of the peninsula. He mentions, in his Historia de la Antigua ó baja California, (see Book I, Chapter II,) "two lagoons near the mouth of the Colorado; the red water of the former gave rise to the river's name." The water is described as being very caustic, and so bad that it causes instant swelling and ulcers, accompanied by a burning pain on any part of the body that is brought in contact with it. The effect is said to last for several days. The cause of these bad qualities is likely to be a certain bituminous mineral issuing from the bottom of those lagoons, where some navigators noticed it first in weighing their anchors.

Besides these lagoons quite a number of interesting facts are mentioned by the same author.—(See Book I, Chapter III, of his work.) Relating to the volcanic character of the shore skirting the base of the Peninsular Cordilleras, the volcano of Mulegé, near 27°, is mentioned. It was

discovered in 1746, by the missionaries; but the Spaniards living there made no mention of any eruption or earthquake caused by it. Native sulphur and pummice abound on the slopes and in the vicinity of this mount. A volcanic axis seems to traverse the peninsula from shore to shore, that is, from the mouth of Mulegé River to the Ballena's Bay, where, besides native sulphur, much vitriol occurs.

At a place called Kadakaamang, near the Mission of San Ignacio, in latitude 29°, an argillaceous mount is mentioned near the beach. On its slope, about 200 feet above the level of the Gulf, there is a horizontal stratum of fossil shells two feet thick.

About seven miles distant from this place a great many fossil oysters are found, some of them being of extraordinary size. One of the missionaries collected some measuring 1 foot 5 inches long, 9 inches broad, and 4 inches thick, and weighing 23 Spanish pounds. It is worthy of notice that here, and in other parts of California, from such fossil shells an excellent lime is prepared.

Around the Bay of Mulegé fossil ostrea are recorded to be quite common, especially on a high mountain in the vicinity of the beach. The rocks here are described as exceedingly hard, and well adapted to building purposes. It abounds in fossil shells, which are found imbedded in the innermost strata. It contains also numerous cavities, which seem to have been once occupied by some marine animals now extinct. This certainly proves a submarine formation of the mountain.

Rocks of a similar class occur frequently along the whole coast of the Gulf. Seven or eight miles from Loreto, in a locality surrounded by high mountains, is a ridge which is said to consist entirely of layers of fossil shells; similar localities are known to exist more than twenty miles from the Pacific coast, near the Mission of San Luis, on the north side of the Sebastian Viscaino bay.

Clavijero thus concludes: "Considering these facts in connexion with the various traces of volcanic activity, and the lar number of islands surrounding the Peninsula, we may imagine what revolutions nature has performed upon this ground. It is, moreover, beyond doubt that the sea has subsided (decrecido) in many places along the coast."

The missionaries of Loreto observed there, during less than forty years, that the tide marks of the sea had receded many yards from the coast, and also that such receding was more perceptible on the west coast. The whole space between the beach and the mountains, a distance of about 26 miles, is deeply overlaid with coast sand (arena litoral.) It is, therefore, evident that the Peninsula in its present configuration has more width now than before our historical era. We may also surely suggest the probability of a continued expansion of the land, until that multitude of islands around California shall be connected with each other and be consolidated finally with the main land.

VOLCANISM THROUGH THE GULF BASIN.

North of Carrizo Creek the country between the Gulf Basin and the Pacific exhibits perfect congruity of petrographic features. There is, for instance, the Pass San Gorgoño y Bernardino, formed by two huge mountain masses, with an elevation of from 7,000 to 8,000 feet each. Here diluvial deposits form a natural bridge of about two miles in width through that mighty

granite gate. This was once the passage of the tidal currents between the Atlantic and the Pacific.

The protrusion of eruptive masses skirting the base of the California Cordilleras seem to have been checked here by some means; their occurrence is at least less frequent in this neighborhood. A little further north, however, another shoot of igneous and metamorphic rocks abuts against the western granite walls. They are a northwestern continuation of the Sonorian Gulf Sierras, crossing the Colorado Valley in the vicinity of the mouth of the Gila, and joining the California Cordilleras somewhat to the north of the before mentioned mountain pass.

Along the eastern base of the Sierra Nevada we find volcanic activity again fully developed. It not only skirts these walls of primary and metamorphic rocks, but seems to have its theatre over the whole area between the Rocky Mountains and the Sierra Nevada.

According to the accounts of American and other explorers, this vast area abounds in salt lagoons, soda lakes, solfataras, geysers, warm and hot springs of various character, extinct craters, and other traces of wide-spread volcanoism.

Tertiary deposits seem not to be wanting throughout these regions; some of them are proved beyond doubt to belong to the Miocene age. Numerous fossils, verifying such conclusions, have been collected by various persons connected with government expeditions. Among other discoveries, is one of the highest importance; this is, the existence of a fossil shell (Cardita planicosta) on the Pacific slope of the Sierra Nevada. This shell, originally belonging to the Paris basin, is common also on the Atlantic side of this continent, and is now known to occur also on the Pacific. From this we have the proof of a former immediate connexion in these latitudes between the two oceans of our globe.

Without making any further mention of other numerous geological and palæontological facts relating to those regions which have been brought to light since the last decenium, we consider the area from the present head of the Gulf up to the Great Salt Lake basin as one tertiary, if not quaternary sea. There were, besides the present Gulf, other inlets from the Pacific to this interior sea; some of them we know already, and others, no doubt, will be discovered a short time hence.

However wide this inland sea may have extended, we find on its western shore primary and metamorphic rocks lined by tertiary strata, and on the east shore metamorphic and volcanic rocks prevail.

The bottom of this present waste, thickly overlaid with diluvial deposits, seems to have been thrown out of its level by upheaving forces from below. We may call them pluto-volcanic, employing a term to designate the immediate ejective forces and the upheaving motions of a general character.

In the regions before us we have innumerable traces of ejected masses, in the shape of igneous dykes and sierras of similar petrographic character, but varying in size. We find, in fact, the former horizotalism of the whole Gulf basin along the Rio Grande and its tributaries, everywhere traversed, intercepted and broken up by metamorphic and igneous mountain ranges. It seems that the observer, in no other locality, stands in closer presence of these very pluto-volcanic upheaving forces, than on the western edge of this ancient inland sea. Whoever passes over this ground, particularly the desolate scenery about Carrizo Creek, if his mind should be the least open to impressions of this kind, must be struck with awe! He will find himself in a locality where nature gives, in a few bold words, a whole sentence of her cosmogonic history.

Here we everywhere find distinct marks of metamorphism, the result of a closely allied cyclopean and neptunic activity.

Changes in the physiography of the country.—One fact closely connected with the physiography of these desert regions is worthy of notice. The regions around New River and other beds of drainage, are inhabited by Indians, who raise on those alluvials, pumpkins, melons, and reap the seed of certain grasses and seeds, especially of an "Amaranthus," called by the Mexicans "Quelite," and by the Americans "Careless weed." These plants are dependents of alluvial soil.

At present the New River is often subject to dry up entirely for one or two successive seasons, thus leaving this forlorn people to the most bitter adversity. Whether this was always the case we were not able to find out, but there is some probability such was not, for if it had been so, these Indians or their ancestors would not have settled in this neighborhood.

According to traditions and observations made on the spot, water must have been distributed in former times more abundantly over the desert west of the Colorado, since either changes in the conditions of the climate or alterations in the level of the land, or both, must have taken place, causing a gradual diminution of drainage, and necessarily a subsequent decrease of population.

All accounts which have come to our knowledge agree upon an increased sterility of soil. Several localities are pointed out where in former times plenty of grass and mezquite, besides spacious planting grounds, were found.

Pascual, the present chief of the Yuma Indians, when a child, lived at "Alamo Mocho," where at the time (he is now about 60 years of age) water was running constantly, as it did also at New River. The place of Pascual's childhood was called Hu-ta-pil, because plenty of tunas (the fruit of opuntia) grew there. Of all this, nothing seems to have been left but the name "Alamo Mocho," (stunted cotton-wood,) as one tree of the kind marked this locality long after water had ceased to run here. If such changes really have taken place, and there is hardly room for doubt, we are inclined to ascribe the cause to an alteration of level—hyetographical changes being, perhaps, but the result.

It is not improbable that this portion of the Peninsula participated in a similar rising as Clavijero mentioned in regard to the southern regions of this country.

We have already mentioned the earthquakes to which these regions, together with all California, are subjected. They may be considered as principally instrumental in producing those general changes upon the surface. Here every three or four years heavy vibrations of earthquakes are witnessed. Major Heintzelman thus writes of a severe shock experienced the 29th of November, 1852: "At the time the river was unusually low, and (the Laguna) behind the post uncommonly high. (Behind Camp Yuma there is an old river bed.) Low grounds became full of cracks, many of which spouted out sulphurous water, mud, and sand. Further below, the river bed was changed considerably. The re-opening of a salfatara in the southwest corner of the desert was mentioned as the result of this earthquake."

Similar accounts of the same event were given by another eye-witness. He was at the time on board a small river steamer, about twenty miles below the mouth of the Gila, and on guard, when a heavy shock was felt on board, upon which the general alarm was given, "Boat aground!" Our informant, formerly a sailor in the South Pacific, on the coast of Peru, and

also a visitor of the Sandwich Islands, having witnessed there the outbreak of the notorious "Ruaroa," knew instantly what it was, and coolly remarked, touching bottom with a sounding-pole: "Yes! Boat aground in eight feet water!" The waters of the river were thrown in a sort of boiling motion, with a strongly rippled surface. The river banks on one side caved in; and on the other separated in a thousand cracks, from which dust, sand, mud, and water was jetting. In front of the steamer, at the time, there was a ferry-boat, loaded with sheep, just crossing the river. The hands in charge of it not knowing what to think of the phenomenon, in their fright threw away their oars and poles, and held on to the sides of the boat, expecting to go down. The river formed new bends, leaving portions of its old bed so suddenly that thousands of fishes were left lying on the muddy bottom to infect in a few days the air along the river by their putrefaction. The frequency of earthquakes occurring here forms also a point in the mythology and traditional tales of the aborigines, which has been referred to elsewhere.

Mountain rupture.—Eight miles below Fort Yuma another trace of the action of earthquakes is exhibited on the eastern foot of the Sierra Culaya, or Pilot Knob, as it is styled by the Americans. The metamorphic rock forming the knob is a dark syenitic granite, with much hornblende. At its base the Colorado turns abruptly to the south. One of the outrunners of the sierra shows a rupture with an average width of about thirty feet. The edges of this mountain cleft fit each other, so as to leave no doubt that they formed one mass. By means of this gap the post-tertiary banks of the river, 70 feet high, can be seen. (See annexed sketch.) The course of the Colorado, which runs on higher ground than the surrounding desert, and the configuration of the junction of the Gila and Colorado, (elsewhere described,) is, perhaps, another result of a geological disturbance in the general level of country.

Dr. J. Leconte, in his notes on some volcanic springs in California, which have been heretofore referred to, mentions also the anomalous course of the Colorado not taking the lowest level of the desert, but retaining its bed about 130 feet above it. He ascribes the cause to the deposition of its sediment, somewhat like the Mississippi and other rivers in our southern States.

The explanation ascribing the anomalous course of the river to the deposition of its sediment may be correct to some extent, but we deem it not sufficient to account for so great a difference of level.

A glance at the profile of this country will explain the relation between its geological and meteorological condition, which I have before hinted at.

Clouds rising from the ocean, borne by aerial currents towards the mountain slope of western California, ascend easily towards the dividing crest. As soon, however, as they pass that line they meet columnar currents of heated air whirling up from the intensely insulated desert flats; dispersion and dissolution of those aqueous deposits of the atmosphere follow naturally, and hence the almost incessant drought the Colorado basin is subject to.

Rain destined to fall upon these desert regions needs probably some heavier disturbances in the electro-magnetic action of the air, and hence what is called the rainy season in these regions is nothing more than the hottest time of the year, when electro-magnetism comes to its highest pitch of activity.

Equal causes produce similar results, therefore the meteorology of the Colorado basin and Northwestern Sonora are nearly related.

VALLEY OF THE COLORADO DEL OESTE AND EAST SLOPE OF THE SIERRA, CULATA.

UNITED STATES AND MEXICAN

BOUNDARY SURVEY,

UNDER THE ORDERS OF

LIEUT. COL. W. H. EMORY,

MAJOR FIRST CAVALRY, AND UNITED STATES COMMISSIONER.

GEOLOGY AND PALÆONTOLOGY

OF THE BOUNDARY:

BY

JAMES HALL,

OF ALBANY, NEW YORK.

GEOLOGY AND PALÆONTOLOGY.

Colonel W. H. EMORY,

Commissioner for the United States and Mexican Boundary Survey.

SIR: In accordance with your direction, I herewith transmit to you my report relating to the Geology and Palæontology of the Boundary Survey.

The collections of the original survey were placed in my hands, in 1853, by Dr. C. C. Parry, of the Boundary Commission. These consisted of a series of rocks, minerals, and fossils, collected along the line of the survey, and along the route travelled through Texas. The fossils consisted chiefly of Cretaceous and Tertiary species; and some of these had previously been submitted to Mr. Conrad, who described several species in the Proceedings of the Academy of Natural Sciences, of Philadelphia. There were still in the collection a considerable number of undescribed species; and although placed in my hands for final arrangement and disposition, I preferred that Mr. Conrad should complete the work he had begun, and accordingly transferred the new species to him for description. In the meantime, I had the drawings made and arranged as far as practicable previous to May, 1854. At this time an examination of some collections that had remained in Washington brought to light other species, and the number of figures and plates were increased by these additions.

The collections of the Survey of the New Boundary, in 1854 and 1855, have also contributed several new species to those previously described, and these I have likewise submitted to Mr. Conrad,* in order that the descriptions might, as far as practicable, possess a unity of character and design.

The collections have largely contributed to our knowledge of the extent and character of the Cretaceous formation in the southwest. This information, taken in connexion with the results which have been obtained in the west and northwest, enable us to determine with a great degree of accuracy the character and relations of the different members of the Cretaceous period, as developed in the United States.

The collections of Palæozoic fossils contain specimens from the upper carboniferous or coal measure limestone, which is known to become extensively developed in the west and southwest. A single specimen of *Asaphus* (*Isotelus*) indicates the existence of lower silurian strata, and since the specimen is scarcely worn, it cannot have been transported from a distance. It is the first specimen of undoubted lower silurian age that has fallen under my observation in all the collections that have been made in the southwest. I should not, however, omit to remark, that a specimen of coral found in the same locality (though exhibiting no decided marks of trans-

*Except the few species of Echinoderms, which, at the request of Mr. Conrad, I have described in their proper place, one only being a new species.

portation) is apparently identical with specimens found in the immense drift deposits far to the northward, in Nebraska and at other places; and although quite possible that both the trilobite and the coral have been derived from the extreme northern exposures of the older rocks, I am nevertheless prepared to expect that these formations will be found nearly coextensive with the carboniferous limestones.

Although there are among the collections of the Boundary Survey several specimens which appear referable to a position below the carboniferous limestones, and in the later collections some silurian or devonian corals, yet in the absence of other information than that furnished by the specimens, which do not bear evidence of having been freshly broken from the rocks, I do not feel warranted in drawing any general conclusions. This subject is one of the greatest interest for future explorers in that region.

The specimens of igneous and metamorphic rocks from the eastern and central portions of the route travelled are all unlike those so well known in the eastern part of the United States; and it is not until we approach the range of the Cordilleras that we find specimens bearing all the lithological characters and associations of the metamorphic rocks of the Appalachian chain.

We are constrained to believe, not only from the evidences of this collection, but from others previously examined, that the metamorphic rocks of this intermediate region are to a great extent newer than those of Silurian and Devonian age, which we know to be the age of a large part of the metamorphic portions of the Appalachian chain. This conclusion, or we may say suggestion, is deduced from the differences in lithological character, as well as from the fact, already stated, that the upper carboniferous limestone is the most conspicuous unaltered rock of the region, while in some places this rock itself, as well as strata of more recent date, appear to pass into a metamorphic condition.

In regard to this carboniferous limestone, it should also be borne in mind that it is not the carboniferous limestone of the Mississippi valley which attains this force farther west, but a limestone high in the coal series, and which has become thus developed, while we are yet ignorant of the existence of the lower carboniferous limestone in that part of the country.

The collections of the Boundary Survey, when compared with those made in traversing the country along lines farther to the northward, present a great similarity of aspect and lithological character. The cretaceous belt, bordering the metamorphic and igneous region which succeeds in turn, and in the midst of which are large areas of limestone just mentioned, and also some smaller areas of cretaceous rocks, which have now been traced quite to the central part of the great basin to the west of the first mountain chain, and have more recently been determined in California.

We have the means of knowing, therefore, the general geological structure of the country, from near the northern limits of the United States to Mexico.

The first part of my report, constituting the observations upon the specimens collected, and the general results regarding the geographical distribution of the formations along the line of the Boundary Survey, are essentially the same that I transmitted to you in 1854; but which, in consequence of the change in the boundary line making a re-survey necessary, were not published at that time.

I have since reviewed the whole collection, with all the additional information derived from

other sources, and comparison of other collections from rocks of the same age, and particularly those of the cretaceous period from western localities and from New Jersey. These results are given in the chapter upon the relative position of the cretaceous fossils of the Boundary Survey with other known cretaceous formations in the United States.

The relations of the carboniferous limestone of the Rocky Mountain range, I have endeavored to make more clear by a few pages upon the carboniferous rocks, and a section of the principal members belonging to that period, as known in the Mississippi valley.

The specimens from the Tertiary formation of the southwest, although indicating a general similarity to the formations of Nebraska, are nevertheless insufficient to give the means of careful comparison and reliable conclusions.

Our knowledge of the geological formations of the west is now so rapidly progressing, and the materials accumulating in such abundance, that whatever may be presented to-day as new and in advance of previous knowledge, will to-morrow be regarded only as a historical record of our progress. The facts here presented, and the conclusions deduced from these and other collections which I have heretofore examined, may serve as a contribution towards a more perfect elucidation of the geology of this great central region, which has been traversed by the Boundary Survey commission.

I have the honor to remain, very respectfully, your obedient servant,

JAMES HALL.

OBSERVATIONS UPON THE CHARACTER AND GEOLOGICAL AGE OF THE SPECIMENS OF ROCKS AND MINERALS SUBMITTED TO MY EXAMINATION FROM THE COLLECTIONS OF THE UNITED STATES AND MEXICAN BOUNDARY SURVEY.

I. *Specimens from the Gulf Coast, Texas, as far as El Paso, including all those from the east side of the Rio Grande.*

1. Calcareous sandstone, branch of the Guadaloupe river below San Antonio. This rock is apparently of Tertiary age, and presents nothing peculiar in its character, except its loose aggregation and numerous dark siliceous specks or grains.

2. Calcareous conglomerate, fifteen feet thick.

These specimens bear the character of the Tertiary sandstones known in Kansas and Nebraska. They are sometimes highly calcareous. The sandstone varies in character from loosely aggregated and incoherent sand to a compact calcareous sandstone or quartz rock, for the grains sometimes appear to have been cemented by fluid silica.

From information obtained in connexion with these specimens, the strata to which they pertain occur in outliers of greater or less extent, the original formation having been subjected to extensive denudation. The similarity in lithological character and association suggests a probable identity in age between these beds and those of the Mauvaises Terres of Nebraska; and that the Tertiary is probably co-extensive with the cretaceous formation from Nebraska to Texas and New Mexico.

3 and 4. Argillaceous, buff-colored limestone, a thickness of fifty feet, ascertained in sinking a well, while the entire thickness of the rock is much greater. This rock is used for buildings in San Antonio. It has the same lithological character as the stratum which elsewhere contains *Inoceramus mytiloides.—I. problematicus.*

5. A yellow granular limestone of similar character, but more compact than the limestone of Timber creek, New Jersey. The specimen contains a species of cardium. The rock from which this specimen was obtained occurs about twenty miles further to the west than Nos. 3 and 4, and is penetrated in reaching a more compact stratum below.

These specimens are from the lower part of the cretaceous formation.

a. *Specimens from the table-land on Devil's river.*

6. Light gray limestone with cretaceous fossils. Painted caves.

7. A more granular limestone than the preceding, resembling No. 5 in character, and containing valves of an *Ostrea.* Painted caves.

8. Compact, reddish brown granular limestone, containing *Nodosaria.* This rock, on its weathered surface, is of the character of the preceding, but more compact and crystalline in its texture.

9. Compact, subcrystalline, yellowish limestone; sometimes of a brownish yellow. Table-land beyond Devil's river.

10. Vesicular trap from isolated hills and ridges rising from the table-land.

11. Compact, light ash-colored limestone, containing cretaceous fossils; among which are *Lima Wacoensis*, *Trigonia Emoryi*, *Gryphæa Pitcheri*, and other species. Camanche crossing, Camanche springs.

b. *Specimens from the Limpia range of mountains, between the Pecos river and Rio Grande.*

12. Brown porphyritic trap rock, with crystals of Adularia.

13. Coarsely crystalline igneous rock, (trap-like in some parts,) composed in a great proportion of crystallized feldspar or Adularia, having a châtoyant lustre on the cleavage faces. This rock forms the central part of the mountain range.

14 Compact quartz rock, of a slightly reddish tint, with minute cavities.

15. Compact white opaque quartz, approaching chalcedony in its characters.

These specimens from the Limpia range are of igneous origin, the quartz rock having been derived doubtless from the gelatinous silica produced by volcanic waters. We have no evidence from the facts before us that any part of the range consists of Metamorphic stratified rocks. They are mostly of reddish-brown porphyry and a coarse granitic aggregate, of which Adularia forms a large part. Some specimens of milky quartz appear as if due to depositions from hot springs.

c. *Stratified rocks to the northwest of the Limpia range.*

16. Compact, fine grained limestone, dipping to the southwest.

17. Same as the preceding.

18. Limestone of similar character to the preceding, containing remains of crinoidal columns and shells.

19. Similar limestone with remains of shells; (Brachiopoda, etc.)

20. Limestone like the preceding, of a grayish blue color, containing fragments of *Terebratula*, etc., (probably *Terebratula subtilita*.)

Although these specimens present no well marked fossil species, I am nevertheless quite convinced, from the character of the fragments preserved, that the rock is of the age of the upper carboniferous limestone. The condition and character of the rock with the fragmentary fossils is precisely identical with specimens from the neighborhood of the Great Salt lake and other western localities. They contain remains of small Terebratula in like manner; and the numerous fragments of organic bodies which cover the weathered surfaces indicate sufficiently that the rock is in great measure composed of similar materials. Some of the specimens are quite compact, and others are granular in texture; they are traversed by minute veins, sometimes of calcareous spar, and sometimes of harder material.

21. Siliceous tufa, resembling trap tuff. It consists of an aggregation of finely divided siliceous matter, porous or minutely cellular in structure. It is represented as forming dykes in the limestone. Two specimens from Eagle spring.

22. Specimens similar to the last, but coarsely laminated, and with minute concretions; brecciated, etc. Eagle spring.

23. Light-colored amygdaloid rock. Eagle spring.

24. Porphyritic trap. Eagle spring.

25. Brown porphyry; compact.

26. Brown porphyry; same as the preceding, except that it contains cavities, which are probably due to the weathering out, or solution of crystals from the mass.

27. Chalcedony mixed with Feldspathic lava. This rock has been formed by gelatinous silica penetrating scoria or other loose volcanic materials.

28. Chalcedony. Two specimens, associated with the preceding rocks.

The volcanic products present numerous modified conditions, from the effect produced by silica in solution, or in the gelatinous condition, having penetrated the mass. From this cause, and from the effects of heated water, not only the lithological aspect, but the color of the rock is often greatly modified.

29. A siliceous stratified rock, apparently a highly altered sandstone. From the Rio Grande, seventy miles below El Paso.

30. A porphyritic trap-like rock, perhaps a sedimentary rock altered by volcanic action. Seventy miles below El Paso.

31. Greenstone trap. Seventy miles below El Paso.

32. Volcanic breccia, a gray feldspathic mass with hornblende. Same locality as the last.

33. Volcanic breccia, becoming porphyritic; more compact and crystalline than the preceding.

34. Granitic mass; a volcanic granite, composed of feldspar and hornblende, with little quartz; probably a further modification of the breccia by igneous action. Seventy miles below El Paso.

The range east of the Rio Grande, seventy miles below El Paso, has furnished specimens of reddish and greenish compact porphyry, compact trap, a specimen of granitic structure consisting of feldspar, mica, and some earthy matter, but loosely aggregated, not unlike the products of recent igneous formations; also several specimens of volcanic breccia loosely aggregated, and a single specimen of similar composition very compact in texture. From this locality there is also a specimen of carboniferous limestone, partially crystalline, and one side permeated by innumerable minute pores; but it still preserves evidences of organic remains on its weathered surfaces.

d. *Specimens from the Tertiary Basin of the Rio Grande.*

35. Selenite mixed with marl from a bluff composed of marl, gravel, and beds of selenite. The crystals occur in detached groups, but altogether form large beds.

36. Cretaceous limestone with *Exogyra texana*, and *Serpula*. El Paso.

37. Argillaceous limestone with *Inoceramus*, from the Rio Grande above El Paso.

38. Hornstone with seams, or a brecciated intermixture of limestone with hornstone, forming the summit of a mountain 1,200 feet high. The base of the mountain is composed of the upper carboniferous limestone. Near Frontera.

39. Black hornstone, surrounded by a lighter colored mass of the same. Near Frontera.

40. Feldspathic or granitic volcanic rock, composed mainly of Feldspar and Olivine. Two specimens from near Frontera.

41. Compact feldspar with a little glassy quartz: forming knobs and dykes running through the limestone strata; sometimes overlying and sometimes underlaying the latter rock. It is evidently of volcanic origin.

No. 40 forms isolated knobs less intimately connected with the limestone than No. 41.

The specimen marked "Isolated knobs near Frontera," consists of feldspar and olivine, and is a modern igneous product.

The specimen marked "Granite, north of Frontera," is a similar aggregate, more compact and containing scales of mica.

The mountain northeast of Frontera is partially composed of reddish feldspar with small grains of crystalline quartz; a kind of porphyritic rock. The position of this rock is remarkable and highly interesting. A sectional sketch of the mountain by Dr. C. C. Parry, represents it as resting on the upturned edges of the strata of carboniferous limestone, which form the base and greater portion of the mountain, and dip at an angle of 45°. The granitic aggregate rests on the sloping sides of the mountain, in the direction of the dip. At a little distance from this point, and apparently resting on the latter rock, occur cretaceous strata, highly inclined, as if the igneous mass had been forced out near the junction of the carboniferous and cretaceous beds. In other instances the igneous beds rest on the cretaceous deposits; leaving no doubt that the eruption took place subsequent to the cretaceous period.

The specimens from 35 to 41 inclusive, present the characters of the different members of a section across the Tertiary and cretaceous strata, to the upper carboniferous limestone; with the associated igneous rocks which form separate and isolated masses, or are more or less entangled in the stratified limestone.

e. *Specimens from the Organ Mountain range, fifty miles north of the locality of Nos.* 40 *and* 41. *The elevation of this range is about* 2,000 *feet above the bed of the river.*

The specimens from the Organ Mountains consist of compact feldspathic granite with very little quartz, a few scales of green mica and hornblende, and numerous minute crystals of magnetic oxide of iron. Notwithstanding the compactness of this mass, the character and mode of aggregation are so similar to some of the well-characterized volcanic products that it can scarcely be regarded as an ancient granite. Resting on this rock occurs very compact greenstone porphyry. A specimen from the western base of the mountain is a reddish lava-like porphyry with a finely porous or vesicular structure.

42. Granitic rock, composed of crystalline feldspar with a smaller proportion of quartz and hornblende. The specimen is less lava-like than No. 40, but it has the aspect of a very modern igneous rock. This constitutes the central portion of the mountain range.

43. Porphyritic greenstone, very compact, forming the mass partially surrounding No. 42. This rock occurs in distinct layers dipping at an angle of 82° W.

44. Brown porphyritic trap, overlying the granitic central mass of the mountain.

45. Reddish brown, compact, lava-like rock, containing minute crystals of feldspar; associated with Nos. 42, 43, 44, forming extensive masses.

46. Sulphuret and phosphate of lead, sulphuret of copper, and sulphate of baryta. There are several specimens all presenting the same general character, and obtained from a vein in the mountain range.

47. A coarse porphyry; a red, coarse, loosely aggregated base. Near the San Antonio road.

48. Volcanic breccia. Near the San Antonio road.

49. Amygdaloidal trap; a common, grayish base with round vesicles. Tascate.

50. Porphyry.

51. A porphyritic rock with chalcedony.

52. Compact, laminated porphyritic rock.

53. Compact, micaceous, gneissoid sandstone, slightly calcareous; dip S.S.E. 60°.

This sandstone has the aspect of a cretaceous or tertiary sandstone.

54. Laminated, compact, argillo-calcareous rock, which has been subject to igneous action, and partially altered.

The two preceding specimens are from strata overlaid by trappean rock, before noticed; and their altered condition is doubtless due to this action. This fact places the date of these eruptions subsequent to the cretaceous period, and perhaps posterior to the older Tertiary deposits.

55. Encrinital, subcrystalline, light-gray limestone, containing numerous fossil fragments; belongs to the upper carboniferous period; dip to the southeast. Cibolo creek.

56. Argillaceous sandstone with mica, fine-grained and thinly laminated. The age of this sandstone is doubtful, but it may be carboniferous. Cibolo spring.

57. Compact porphyry. Cibolo creek.

58. Limestone of the upper carboniferous period, forming high mountains; dip southeast. Presidio del Norte.

This rock is similar to that from Cibolo creek, but more compact and less crystalline, and evidently has undergone a partial metamorphism.

A specimen from the rapids of the Del Norte is of a bluish ashen color, very compact and fine-grained, with numerous crystalline points and lines which mark the presence of organic bodies. Although no fossils can be recognized in their specific character, yet the rock is so precisely of the character of the carboniferous limestone in numerous western localities as to leave no doubt of its true age and geological position.

The specimens from Buffa-silla, marked "Aug. 10," consist of the following: two specimens of vesicular lava, one of compact breccia, enclosing fragments of lava, and several specimens of trap tuff, enclosing quartz pebbles and fragments, and becoming, in one specimen, a sort of friable breccia. Another specimen from the same locality, marked "Aug. 13," is a compact, volcanic breccia, composed mainly of fragments of various volcanic materials.

59. Vesicular lava, Buffa-silla.

A second similar specimen.

60. Compact lava, Buffa-silla.

61. Volcanic breccia, composed of fine white volcanic ashes, with pebbles and fragments.

62. Coarser breccia, with a coarser base than the preceding.

The compact lavas are represented as lying below, and the breccias between these and the more cellular lavas above. Sometimes there are several successive series of these beds.

63. Granitic or compact feldspathic lavas, with quartz and hornblende in small proportions.

Three specimens from the cañon of the Rio Grande.

A specimen from the cañon of the Rio Grande, marked "Aug. 27," consists of a crystalline aggregation of quartz, feldspar, and carbonate of lime. Two other specimens, same date, from Puerto Peak, are granitic aggregations of quartz and feldspar, and appear much like a partially fused breccia.

64. Cemented volcanic ashes, with, occasionally, small vesicles, giving an amygdaloidal character.

Three specimens, showing variety (of 64.)

65. Breccia with a white base.

66. Lava, less compact than that below.

The series shows the succession of compact lava, breccia, and less compact, or vesicular lava above.

67. A fragment including part of a cavity in amygdaloid, with green quartz.

68. Brownish porphyritic rock. This has the common character of the porphyry of the region.

69. Crystallized peroxide of iron, connected with the trap or lava deposits.

70. Porphyritic granite, apparently of very modern origin.

71. Sienite or porphyritic granite, varying but little from No. 70. It contains dark smoky quartz.

72. Reddish porphyry or porphyritic trap, associated with the preceding specimens.

73. Compact argillaceous limestone of the Cretaceous formation.

74. Compact, close, and fine-grained argillaceous limestone of the Cretaceous formation.

75. *Exogyra texana*, from above the Pecos river.

76. Argillaceous limestone, with *Exogyra*, containing cavities filled with calcareous spar.

77. Fossil wood from Tertiary strata; Eagle Pass.

II. *Specimens from the country west of the Rio Grande.*

78. Sandstone, compact and fine grained. Cemialauke.

This rock is said to form a mountain range in connexion with the conglomerates. The specimens are not sufficient to determine satisfactorily the geological age of the formation.

79. Carboniferous limestone with fossil remains.

These specimens, (79,) from west of Salado, have evidently undergone partial metamorphism, though still preserving fragments of organic remains. One of them contains several imperfect shells, among which a Terebratula is distinguishable.

80. Porphyritic lava, connected with the preceding limestone; and breccia, connected with the same.

81. Compact trap, with a silicious incrustation covering the surface.

82. Amygdaloid.

An extensive district is represented as covered by rocks like 81 and 82, on the southwest of Frontera.

83. Amygdaloid, similar to the preceding; one hundred miles west of El Paso.

84. Specular iron ore. It occurs in loose masses, scattered over the Tertiary plains.

85. Chalcedony, associated with trap rocks.

86. Feldspathic lava, or compact trap tuff.

Rocks of this character are represented as forming the dividing ridge and summit of the Sierra Madre near the Gaudaloupe Pass.

88. Quartz rock; some portions are granular, showing the passage from an arenaceous mass to a compact homogenous quartz rock.

(This is, apparently a metamorphic stratified rock.)

A specimen from the summit of the Gaudaloupe Pass presents the character of rounded

crystalline grains of quartz, in a paste of milky quartz. In many parts the granular structure is seen passing into the homogenous texture. This sandstone is associated with the carboniferous limestone.

89. A reddish colored stratified rock; apparently an altered shale becoming porphyritic.

90. An argillaceous sandstone; the granular structure gradually merging into a compact chalcedonic mass.

91. Conglomerate, associated with the preceding specimens, 89 and 90. The rock has the aspect of a Tertiary conglomerate.

92. A compact granular mass of feldspar and olivine.

93. A similar mass, colored by oxide of iron. The change of color perhaps due to infiltration of heated water.

94. Conglomerate, composed of quartz pebbles, trap, and other volcanic rocks, with much calcareous matter. The pebbles are somewhat angular. (A modern product.)

95. An earthy calcareous rock, associated with the preceding conglomerate.

96. Compact dark colored trap rock.

97. Talcous slate, with quartz veins.

98. Granite, fine, granular, consisting of quartz, feldspar, and mica, in nearly equal proportions, and having a more ancient aspect than the granite found associated with the trap rocks.

These two specimens (from the same locality) give the first indications of an approach to rocks of a character similar to those composing the Appalachian mountain chain; and which are like the products of metamorphic silurian strata.

III. *Specimens from the silver and lead-bearing rocks of the Corriletas.*

99. A compact silico-calcareous rock, with a few scales of mica. It appears to be an impure subcrystalline limestone, and is associated with other specimens of limestone. This is represented as forming the rock traversed by the veins of silver-lead ore.

100. Sulphuret of lead and silver.

101. Sulphuret and carbonate of lead.

102. Sulphuret of lead connected with a gray limestone.

103. Earthy carbonate of lead, said to contain silver.

104. Semi-crystalline limestone associated with the earthy carbonate of lead, which latter is represented as occurring in beds or veins, distinct from the sulphurets.

105. Limestone similar to the preceding, colored brown by oxide of iron.

106. Compact, silicious limestone, which has undergone some alteration from igneous action.

107. Compact, altered limestone, associated with the silver ores of the San Pedro mines.

A specimen said to be associated with the silver of the San Pedro mine is a greenish, impure limestone, with light colored or white crystalline points. The weathered surface presents minute cavities, and it has altogether the appearance of an ordinary greenstone. On testing by acids, it effervesces strongly, and is evidently highly calcareous.

108. Cretaceous limestone containing shells of Exogyra, &c., from the foot of the mountain in which the silver ores occur.

The cretaceous strata overlie the upper carboniferous limestones, and are shown to have been subjected to similar disturbances, so far as the elevation of the strata is due to such action.

109. Red oxide and green carbonate of copper.—Copper mines of New Mexico.

110. Green carbonate of copper.—Sonora.

111. Gray sulphuret and green carbonate of copper.—Copper mines of Presidio del Norte.

112. Sulphuret of lead and silver, with crystals of sulphate of lead.—Santa Rosa.

The specimens from Santa Rosa are from veins, and do not furnish any of the associated rock.

The specimens of rock from the Leon mine are a semi-crystalline limestone of a mixed gray and white color, with calcareous spar; and a crystalline limestone colored brown by oxide of iron. The other specimens from this locality are vein-stones or ores.

In the vicinity of the mines of Corriletas, the limestone has undergone still farther metamorphism, and some specimens which occur in the same connexion, and apparently of this age, assume a very crystalline character, and exhibit mica and some other minerals, which have been segregated from the mass during the progress of metamorphism.

The specimens of limestone from the Escandido mines include one of a yellowish white color and crystalline texture, containing disseminated crystals of iron pyrites: this may be a vein-stone. Another specimen is of very compact, bluish, granular limestone, with thin pressed veins of spar, evidently having undergone some metamorphic action. This is labelled as coming from the foot of the mountain adjoining the mines. Other specimens marked as from the same locality contain large numbers of fossil shells, but in such a condition as to afford very unsatisfactory means of determining their age. They present, however, many features like those of the cretaceous limestones, and are probably beds of that formation, which have undergone partial metamorphism.

B. SPECIMENS COLLECTED ON THE ROUTE FROM THE PACIFIC COAST EASTWARD, INCLUDING THE TERTIARY OF THE COAST AND THE METAMORPHIC ROCKS OF THE CORDILLERAS; THE TERTIARY OF THE GREAT PLAIN EAST OF THE CORDILLERAS, AND THE METAMORPHIC ROCKS OF THE ISOLATED MOUNTAINS IN THE GREAT PLAINS.

IV. *Specimens from the coast Tertiary belt, from the neighborhood of San Diego.*

1. Gray micaceous sandstone, with more or less of argillaceous matter, friable, or more or less compact.

2. Calcareous beds with shells, Turritella, Pectunculus, &c.

3. A fine chalk-like, tufaceous deposit, occurring in isolated beds.

4. Lignite, associated with clays and sands.

V. *Tertiary formations spreading over the plain east of the Cordilleras.*

1. Sands and marls with clays, all more or less calcareous; represented as forming extensive beds of considerable thickness, and cropping out in bluffs of several hundred feet high.

2. Shells of *Ostrea vespertina*, from the beds of the preceding series.

3. Calcareous tufa; forming isolated masses or deposits.

4. Gypsum—Selenite. This mineral occurs in the clays and marls of the formation.

5. Common salt, forming on the borders of lakes from evaporation. The soil is more or less permeated with saline matter, which is carried downwards to the depressions in which occur the small lakes having no outlets.

6. Sandstone. A fine-grained, friable, micaceous sandstone, occurring above the marls and clays, and represented as attaining a thickness of from 100 to 200 feet.

The sandstone contains nodules of clay, which are often large and flattened, forming an irregular or interrupted layer. These nodules are frequently surrounded by pebbles or small gravel. These pebbles consist of quartz, porphyry, greenstone, jasper, &c., and sometimes form layers of conglomerate. From the evidences of drift action afforded in the specimens, it is probable that the formation may at some points present extensive beds of conglomerate.

This sandstone is precisely of the same character as the Tertiary sandstone of the Mauvaises Terres of Nebraska.

7. Coarse sand and small pebbles cemented by calcareous matter, forming a conglomerate which has a thickness of 30 or 40 feet.

8. Fossil wood—an erratic mass found upon the plains.

9. Vesicular lava, having the cavities filled with earthy matter, and embracing small shells like Ceritheum, but too imperfect to be specifically identified.

The table-land occupied by this Tertiary formation forms the plateau in which the rivers take their rise.

V. *Specimens from the Coast Range.*

1. A somewhat vesicular trap or greenstone, containing spots and blotches of soft green earth.
1. Greenstone porphyry.

VI.—*Specimens from the westerly part of the Cordilleras.*

1. Chloritic rock, having a compact or scarcely laminated structure.
2. Chloritic or talco-chloritic rock, with hornblende, etc.
3. Black mica, with quartz veins.—Pine ridge, 16 miles E. of San Luis Rey.
4. White quartz, with schorl.
5. Quartz and feldspar; granitic in its structure, and containing schorl.—Near Santa Isabel.
6. Feldspathic granite, very similar to the preceding specimens.—Near Acapulco.

VII.—*Specimens from the central portion of the dividing range.*

1. Granitic or sienitic rock, composed of quartz with black hornblende in blotches and a little mica.—From the bare peaks of the Cordilleras, near the boundary line.
2 Feldspathic granite, somewhat gneissoid.
3. Feldspathic gneissoid granite.
4. Gneiss.
5. Hornblende rock; dark colored.

This rock is very similar in character to much of the rock of the Green mountain range.

6. Fine-grained syenitic rock, with hornblende in crystals on the surface.

The specimens enumerated above, from 2 to 6 inclusive, are evidently from the same formation of metamorphic rocks in the exposures of the different beds.

7. Rose quartz; from a loose mass, though probably derived from this metamorphic belt.
8. Black tourmaline; a loose mass.

9. Crystalline quartz, with black tourmaline.—Near the dividing ridge of the Cordilleras; east from San Diego.

10. Feldspathic granite, with mica in large plates. The locality south from No. 1 of this series, and belonging to the same (dividing) range.

VIII.—*Specimens from the eastern slope of the Cordilleras.*

1. Coarsely crystalline granite, with much mica and feldspar.—Lower California.

2. Similar to the last, but with a less proportion of feldspar.—Lower California, near the boundary line.

3. Talcose slate, with Anthophyllite.

4. Quartz in veins in the talcose slate.

IX.—*Specimens from the isolated mountains in the great plain of the Cordilleras, near the mouth of the Gila, on the west side of the Colorado River.*

1. Syenitic rock, composed of hornblende and feldspar.

2. Similar to the last, but finer grained.

3. A granitic mass, composed of quartz, feldspar, and mica, with black tourmalines.

4. A granitic mass, consisting chiefly of quartz with laminæ of white mica The quartz contains garnets.

5. Gneiss or mica slate, finely granular and laminated.

6. Epidote rock; crystalline.

7. Epidote with talc; (two specimens;) the talc in thin minute scales, and the epidote finely granular.

8. Epidote and talc; the epidote granular, but arranged in laminæ.

IX.—*Miscellaneous specimens not numbered.*

Specimens designated as follows:

"August 25," compact and amygdaloid traps.

"August 29," marked as the lower stratum, is amygdaloid, having the appearance of fine volcanic ashes, loosely cemented, and containing a few cavities filled with crystalline matter, and others empty.

"September 16," volcanic tuff.

"September 17," green quartz in a cavity of amygdaloid.

"September 30," specular iron ore connected with volcanic rocks.

"October 7," reddish, porphyritic lava.

"November 8, Mount Carmel," coarse syenitic aggregate.

"November 10," reddish vesicular porphyry.

"March 2, 1852," siliceous rock, apparently indurated trap tuff.

"March 26, 1852," granitic lava, or trap tuff, with crystals of feldspar, mica, &c.

"Summit of San Luis Mountains," an indurated tufaceous mass, with cavities lined with quartz.

"Mouth of Guadaloupe river," semi-metamorphic red shale.

"Conglomerate, mouth of Guadaloupe river," breccia, probably of volcanic origin.

"Santa Cruz Pass," compactly granular feldspathic rock, containing minute grains of magnetic oxide of iron. Another specimen is of vesicular trap tuff, colored red by oxide of iron.

"Rio Santa Cruz, above Tilbac," semi-indurated volcanic ash; also a specimen of coarse breccia.

"Igneous rocks west of Salado"—one specimen is compact, feldspathic lava; the other compact, coarse breccia.

"Laguna Santa Maria," finely vesicular trap, with siliceous incrustation.

"Twenty-five miles southwest of Frontera," highly vesicular trap or amygdaloid.

"Baranca," a granular amygdaloid.

The enumeration of this collection of specimens enables us to deduce some general conclusions of great interest regarding the geological structure of the country between the Gulf of Mexico and the Cordilleras range of mountains. The specimens from the eastern part of this range, taken in connexion with what we know of its character in other places, and of the geology between this range and the Pacific ocean, are sufficient to give a very correct idea of the intervening space.

A broad belt along the coast of the Gulf is occupied by deposits of very modern geological age, which may be referred to the same period as the drift and alluvium. This deposit consists of water-worn materials—as sand, gravel, pebbles, &c., which have been spread over the surface in a very regular and even manner. The general elevation of this belt is 300 feet above tide water, and varies little in its height for many miles in extent.

In several places the denudation of this deposit discloses beneath it formations of the earlier Tertiary period. Approaching the borders of the high table-land which commences at the head of navigation on the rivers, the cretaceous formation appears at numerous points in the river beds and banks, and elsewhere where the superficial accumulations are removed.

From the commencement of the table-lands westward, the specimens show the occurrence of a broad belt of the cretaceous formation, interrupted here and there by isolated dykes, or mounds of trap, or other igneous rocks of modern age. Basins of Eocene, marine Tertiary, likewise occur at intervals, resting upon the cretaceous beds. The specimens of the latter formation consist of limestones, some of them extremely compact and dark, and others light colored and friable. Various admixtures of these with more argillaceous matter, and greenish, calcareous sands, sometimes partially indurated, are of frequent occurrence. The numerous fossils collected from different localities leave no doubt in regard to the age of this formation.*

In localities where the igneous rocks are protruded through the beds of this age, a greater or less degree of metamorphism has taken place. Sometimes we find a partial or entire induration of the contiguous masses, and often their metamorphism is so great as to render it difficult to distinguish their age and relations from a simple examination of specimens.

Towards the west the igneous rocks, which first appear in small, isolated knolls, gradually

* I should not omit to notice in this place the very valuable and interesting work of Dr. F. Roemer upon the fossils of the chalk formation in Texas, "*Kreidebildungen von Texas*," &c. This gentleman passed more than two years in the United States, a considerable part of which was spent in Texas. Previous to the publication of this work he had published a description of that country, with a geological map, &c.

The collections now under consideration, though for the most part made at a distance from the principal localities cited by Dr. Roemer, correspond to a great extent with those described by him, and corroborate in the most satisfactory manner his views of the general geological structure of the country.

assume more importance, and extend into long belts. In the Limpia range these rocks present the character of a mountain chain, having an elevation of 6,000 feet, and extending several hundred miles north and south. The specimens from this range present the characters of eruptive and metamorphic rocks. Notwithstanding the syenitic texture of some of the beds, they have still a modern aspect. The different minerals are quite distinct from each other, not blended and imbedded as in the older metamorphic rocks, and their mode of aggregation is also unlike. In addition to this, the occurrence of igneous products of very modern age, which are intimately associated with these rocks, and apparently prevail in great quantity, induce us to regard all these as belonging to a system of eruption and of elevation of very modern date.

We may, however, inquire what other evidences, if any, we have in the surrounding rocks as to the age of these igneous mountain ranges. The great table-land formed of the cretaceous rocks has on its eastern margin an elevation of not far from 1,000 feet. The surface of the country gradually rises to the westward, and near its junction with the igneous rocks of the Limpia range they have an elevation of 3,000 or more feet. On approaching the range, also, we find these beds of cretaceous age dipping at a high angle in various directions, showing great disturbance of the beds, apparently due to the elevation of intruded igneous masses. The beds of cretaceous rock have in some instances been indurated, and otherwise affected by the proximity or contact of igneous masses.

We have, therefore, not only evidence of the general elevation of the country towards the great central range in the inclination of these beds, but we have the positive evidence of local disturbance and change due to the intrusion of these igneous masses which form isolated points or mountain chains.

Beyond the Limpia range, in the neighborhood of El Paso, we have cretaceous rocks, containing numerous fossils. These beds rest upon carboniferous limestone, and all have a westerly dip—the carboniferous strata dipping at a much higher angle than the cretaceous. The rocks of both periods are complicated with volcanic and other igneous rocks; and in some instances the latter have been protruded beneath the cretaceous beds, and rest upon the carboniferous limestone, which is but partially altered. The cretaceous beds of this locality are about 4,000 feet above tide water.

Still farther west, in the vicinity of Corrilitas, cretaceous beds occur in connexion with partially altered limestones and igneous rocks, having an elevation of nearly 5,000 feet above the level of the sea. This is the most westerly point at which any cretaceous fossils have been found on the line of this expedition.

The occurrence of cretaceous deposits in this region is of much interest when taken in connexion with similar discoveries further to the northward. Captain Frémont, in his explorations of 1843 and 1844, brought cretaceous fossils from the eastern slope of the Rocky mountains, Smoky Hill Fork of the Kansas river, in latitude 39°, longitude 105°. In the explorations of 1846 and 1847, Lieutenant Abert collected specimens of the same species of cretaceous fossils, (*Inoceramus mytiloides*, = *I. problematicus*,) at Poblazon, on the western slope of the Rocky Mountains, in latitude 35° 13′, longitude 107° 0′ 2″.*

* Professor Bailey, who identified the fossils in Lieutenant Abert's collection, makes the following remarks: "The fossils from Poblazon consist of gigantic Hippurites, casts from the cells of several species of Ammonites, valves of Inoceramus, identical with a species figured in Frémont's Report, pl. IV, fig. 2,† casts of small univalves and bivalves too imperfect for

† *Inoceramus (mytiloides) problematicus.*

The same species of *Inoceramus* was brought from between the Big and Little Blue rivers, (tributaries of the Kansas river,) by Captain Stansbury. A collection from several points in Arkansas, made by Colonel Frémont in his late expedition, and sent to me for examination in 1854, contains also specimens of *Inoceramus problematicus*, associated with a few other fossils.

The cretaceous fossils which occur in the vicinity of Corrilitas correspond in position, being on the eastern slope of the Rocky Mountains in nearly the same meridian of longitude and between 31° and 32° of latitude. In each of these explorations the points mentioned were the farthest west at which cretaceous rocks with fossils were obtained.

The identity of fossils, the occurrence of the same species of Inoceramus in all these localities, and its association at Poblazon with Hippurites, as in the collections of the Boundary Survey, indicate very clearly the same geological horizon for the strata of all these localities from the Kansas river to New Mexico.

The dip of the strata in the localities is influenced by the igneous rocks in immediate proximity, and is therefore variable, often inclining to the west; while the general dip of the formation is in the opposite direction.*

To the west of the last named localities there occur various stratified, partially metamorphic rocks, some of which may be of cretaceous age; but the information possessed warrants no more than a probable inference. One of the specimens is a somewhat coarse and rather loosely aggregated calcareous gray sandstone, and another is a partially metamorphic silicious slate.

The principal features developed by this collection show the existence of a broad belt of cretaceous rocks, in almost uninterrupted continuity, along the Rio Grande, from below Laredo to beyond San Vincente. On either side are igneous rocks occupying a greater or less extent; and beyond the junction of the Rio Pecos these igneous belts become of more frequent occurrence and of greater extent. The older tertiary deposits occupy isolated basins in the cretaceous formation, and both are covered indiscriminately by the alluvium.

In many places, these drift or alluvial deposits, consisting of waterworn materials, with saline efflorescences, gypsum, &c., are spread out over large areas of the cretaceous formation which forms the fundamental rock of the Llano Estacado or Staked Plain.

The almost constant occurrence of the carboniferous limestone, with these igneous and metamorphic belts, along a great north and south extent, taken in connexion with our knowledge of the existence of this formation on the west and northwest of the Mississippi valley and in Arkansas, offers almost conclusive evidence that nearly or quite all the intermediate space is occupied by the same strata underlying the cretaceous formation.

We already know of a similar association of the carboniferous limestone, over a large extent of country, in the vicinity of the Great Salt Lake, and at intervals farther to the south; and the facts, in connexion, afford a very probable inference that it occurs in similar associations from the southern boundary of the United States, or latitude 28°, to above the 42d parallel.

determination, and teeth of sharks. These fossils prove that the strata from which they were taken belong to the cretaceous formation. The existence of vast beds of this formation on the east side of the Rocky Mountains, and extending from the upper Missouri to Texas, is well known. The occurrence of the same formation on the western side of the primary axis of the Rocky mountains, is quite interesting."

"The dip of the rocks at Poblazon is to the west, or from the Rocky Mountains; and this proves that these mountains have been elevated since the deposition of the cretaceous beds. It is, therefore, probable that the cretaceous beds on both sides of the Rocky Mountains were made by the same ocean."

* The inferences in regard to dip, &c., are founded on observations and sections furnished by Dr. C. C. Parry.

The relative position of these cretaceous beds is precisely the same throughout Texas that it is along the valley of the Mississippi river, in the States of Tennessee, Arkansas, Illinois, and Missouri, where they rest upon the upper carboniferous strata.

In an economical point of view, the most important results shown by this collection are the almost constant association of metalliferous products at the junction of the igneous with the metamorphic rocks of the carboniferous period, or perhaps sometimes with metamorphic rocks of more ancient date.

The collection of silver lead ores and copper ores, from different veins, with the associated rocks, show that they are always near the junction of the igneous formations, and the superincumbent more or less altered limestones. The metalliferous veins, it would appear, always penetrate the limestones, which vary in character from gray or grayish blue granular beds with fossils, to light colored or nearly white crystalline limestones. The [redacted]imens which can be identified are clearly of carboniferous age, though some o[redacted] specimens show that the older Palæozoic limestones may enter into this combination; and possibly some of the cretaceous beds have become so altered as to be undistinguishable from the older rocks, though we have yet had no proof of extensive metamorphism in rocks of this age.

These circumstances, nevertheless, do not affect the general inferences regarding the metalliferous character of the rocks at or near the junction of the two systems. The facts before us warrant the conclusion that the conditions enumerated apply not only to the region actually travelled over, but also to the highly metalliferous regions farther to the south in the same range. These facts also suggest the importance of a more careful examination of this range in its northern extension, which we already know to have the same geological constitution, but which has scarcely been explored with a view to its economical resources.

OBSERVATIONS UPON THE IGNEOUS AND METAMORPHIC ROCKS, AND ASSOCIATED MINERALS, IN THE BOUNDARY SURVEY COLLECTIONS.

The preceding catalogue of specimens, with observations upon their character and geological age, and a resumé of their geographical distribution, may very properly be followed by some notice of their relative positions in the series, and their correspondence with, or difference from, others of the same age in other parts of the country.

From time to time, and from various sources, we have learned that large areas of the central portion of this continent are occupied by rocks of igneous or metamorphic character; and that the plains and valleys present geological formations of different and more recent periods. We have also been made aware of the entire distinctness, in character and origin, as well as geographical separation, of the great mountain chain of the Cordilleras, or Sierra Nevada of the North, from the more easterly ranges of the Rocky Mountains.

Physically, the great central mountain region, or Rocky Mountain chain, with its subordinate ranges, is clearly as distinct from the western chain, notwithstanding there may be numerous isolated peaks and short broken ranges, which form a partial connexion between them. Still, again, the Sierra Nevada and the coast range are recognized as geographically distinct.

Geology has likewise proved these several mountain ranges to be of different origin and of different age. The Cordilleras, or Sierra Nevada, and the subordinate ranges, or isolated mountains dependent upon that stupendous chain, are all of the older metamorphic rocks, consisting of stratified rocks of Palæozoic age, silurian, devonian, and perhaps, to some extent, of carboniferous strata, which have been changed from their original condition, and finally elevated into mountains. The lithological character and mineral products are identical with the rocks of the Appalachian chain, which form the great elevation from Canada and Nova Scotia to Alabama, on the eastern side of our continent. Their lithological characters and mineral products correspond likewise with rocks known to be of that age in other parts of the world.

The series of specimens in the boundary collections, and the specimens in other collections, brought from this mountain range, exhibit all the varieties of mineral materials and differences of aggregation presented in a series of the rocks of the Appalachian formations. The auriferous gravel of California is derived from the quartz veins in the slates and other rocks of the Sierra Nevada, as the auriferous gravels of Canada, Virginia, the Carolinas, and Georgia are derived from the quartz veins of the Appalachian rocks. The auriferous quartz veins of California are the same in character, in age, and origin, as those traversing the metamorphic rocks of the great eastern chain from Canada to Georgia.

There are even stronger, though more subtle, analogies between the rocks and minerals of these widely distant mountain regions, when submitted to the researches of the chemist. Rocks and compound minerals, while known by the same names, are often found, on careful analysis, to possess different proportions of certain elements; or they may in one case contain an elementary mineral substance not known in the other. Now, even in this regard, the researches of chemistry have proved that certain mineral products of the one mountain chain are precisely similar to the same in the other. And we might go still further, and show that the order of succession among beds of a certain character is the same in both mountain chains,

and prove also, by dynamic and chemical laws, that it could not have taken place in any other order.

The present occasion does not require the details of comparison between these two ranges of the same age. Still, it is not a little interesting to know that two mountain chains, produced from the metamorphism of series of strata of the same age, now form, the one the eastern, and the other the western, outlines of our continent. The one has a direction from northeast to southwest, and the other, almost at right angles, from the northwest to the southeast, giving us the great breadth of continent at the north, and the narrow southern extremity.

The coast range of mountains presents us with quite distinctive features in the specimens, and we know from many sources that it consists of recent igneous rocks and metamorphic strata of very modern age, the igneous products being chiefly greenstone or basalt, amygdaloid, and materials of similar character. Further east, the Cordilleras offer a striking contrast in the collections to those made along the route travelled from the coast of Texas to the westward. From the coast to the Rio Grande, the specimens from the Limpia range, from the Sierra Madre, and the Organ Mountains present no character similar to those from the Cordilleras. The granites are all of different aspect, with glassy feldspar, occuring in connexion with known volcanic products, as porphyry, greenstone, and mixtures of quartz, feldspar, and olivine, etc.

There are among these no granites assuming a gneissoid structure; no granites with shorl, tourmaline, or garnets; no talcous (pholerite) slates, chloritic or mica slate rocks, as in the Cordilleras. The lithological aspect of the two collections is at once conclusive of their different age and origin.

Whatever the Rocky Mountains may offer in other parts of their range, that passed over in the boundary survey gives no indication of the occurrence of the older metamorphic rocks. Indeed, the materials of purely igneous origin so largely preponderate, that the few metamorphic specimens appear quite subordinate; while the observations accompanying the igneous specimens prove that they form nearly entire mountains which are crossed upon the route.

We are aware that further to the north there are extensive mountains, which bear rather the character of metamorphic than of igneous products; but even these do not resemble the metamorphic rocks of the western chain.

In the specimens from this range, we see the predominating influence of volcanic action, and the result of the same action in the influence of heated waters holding silex in solution, by which the more porous masses have been penetrated and become solid, or so changed in color and condition that there is an almost infinite variety of these products of one prime source.

OBSERVATIONS ON THE CARBONIFEROUS LIMESTONE OF THE BOUNDARY SURVEY COLLECTIONS, AND ITS RELATIONS WITH THE CARBONIFEROUS LIMESTONES OF THE MISSISSIPPI VALLEY.

The carboniferous limestone, so often mentioned in the preceding pages, and which has been usually referred to in published reports as "Carboniferous limestone," and as "Lower carboniferous limestone," is actually of the same age as the coal measures. This point we have but lately had the means of satisfactorily determining.

Several species of fossils were known to characterize this formation over a wide extent of country, and from their associations the rock was referred simply to "carboniferous limestone,"* without distinguishing the order of position among the different members of that series. Among these species were several known to occur in the coal measures of Ohio, Indiana, Illinois, Iowa, and Missouri, while none of them were characteristic of the lower carboniferous limestones.

In the Missouri Geological Report of 1855, Professor Swallow has placed the limestones and shales of Weston and other localities, which contain these fossils, in the upper coal measures. At the same time, some of them are known to occur in the lower coal measures; and, with our present knowledge, we are constrained to believe that certain species occur both in the upper and lower coal measures of the west.

In order to understand fully the relations of this higher carboniferous limestone of the west to the other members of the series termed carboniferous, it is necessary to present the following section of these rocks, beginning with the upper member:

Section of the carboniferous limestones and the coal measures in the valley of the Mississippi.	LOCALITIES.
VII. Shales, shaly sandstones, sandstones, and seams of coal, with shaly and more compact limestone, constituting the *upper* coal measures. This limestone is designated as the *upper carboniferous limestone*, and constitutes the carboniferous limestone of the Rocky Mountains.	*Localities of the upper carboniferous limestone*, Ohio; Indiana, Illinois; Weston and Bellevue, Missouri; Great Salt Lake, Utah Territory; near Santa Fé, and at the Pecos village, New Mexico, etc.
Coal measures below the limestone, being the *middle* and *lower* coal measures of the Missouri report, and the *lower* coal measures, in part, of Ohio and Pennsylvania.	Ohio, Indiana, Illinois, Missouri, etc.....
VI.—Kaskaskia, or Upper Archimedes limestone.....	Kaskaskia and Chester, Illinois; St. Mary's, Missouri, etc ....
V.—Gray, brown, or ferruginous sandstone	Below St. Genevieve, Missouri, between Prairie du Rocher and Kaskaskia, Illinois.
IV.—St. Louis limestone, or concretionary limestone	St. Louis, St. Genevieve, Missouri; Alton, Illinois; highest beds below Keokuk, Iowa.
III. Arenaceous bed.....	Warsaw and Alton, Illinois; Spergen Hill, Bloomington, Ind.
III. Warsaw, or second Archimedes limestone.....	
III. Magnesian limestone.....	
Beds of passage, shale or marl, with geodes of quartz, etc.	Keokuk, Iowa; Warsaw, Illinois .....
II.—Keokuk limestone, or Lower Archimedes limestone.....	Keokuk, Iowa; Quincy, Illinois; above St. Genevieve, Mo...
Beds of passage, (cherty beds,) 60 to 100 feet	Rapids of the Mississippi, above Keokuk .....
I.—Burlington limestone	Burlington, Iowa; Quincy, Illinois; Hannibal, etc., Missouri..
Oolitic limestone and argillaceous sandstone of the Chemung period.	Burlington, Iowa; Hannibal, Missouri.....

* Dr. Owen in his report upon the Chippewa land district, gives numerous sections of the carboniferous limestone in the Mississippi and Missouri valleys, and its connexion with beds of coal; but he does not speak positively with regard to the position of this rock or its distinction from the carboniferous limestones below.

The limestones in the lower part of the section are those usually termed "carboniferous limestone." The group consists of distinct members, each marked by numerous characteristic fossils, and the whole together representing the phases of a calcareous formation, going on in an ocean, where the conditions of its bed and its limits were subjected to change.

The limestones of this period are well developed in the valley of the Mississippi, from above Burlington, in Iowa, and Oquaka, in Illinois, as far south as below the towns of Kaskaskia and Chester, on the Illinois side, and St. Genevieve and St. Mary's, on the Missouri side. Several of the members are known in Indiana, and one or more in Kentucky, Tennessee, and Alabama, and also in Arkansas. Throughout all this region these limestones, whether developed as the full series or in a single member, underlie the coal measures proper.

In all the collections which I have examined from Texas and New Mexico, and from points further north in the same line, and particularly in the collections made by Captain Stansbury, on his route from the Missouri to the Great Salt Lake, and in that region, I have never observed fossils which are characteristic of any member of the lower carboniferous limestone. We have, thus far, no evidence of the occurrence of lower carboniferous strata among the Rocky mountains; while at intervals from the northern limits of the United States along the range of the Rocky Mountains, and both east and west of the principal range, we have the upper carboniferous limestone everywhere more or less perfectly indicated by its characteristic fossils. Among these are *Spirifer cameratus*, *S. lineatus*, *Terebratula subtilita*, *Productus Rogersi*, *P. semireticulatus*, *Zaphrentis Stansburyi*, and others. From a recent comparison of specimens from Ohio, Illinois, Iowa, Missouri, Kansas, Texas, and New Mexico, I find the same association of species from numerous localities.*

In the eastern and northern part of the State of Ohio, (and perhaps extending into Pennsylvania,) there are thin bands of limestone associated with the coal measures. These beds are usually shaly in character, often separated by wide vertical joints, and weather to a brown color. Although recognized at numerous points, I am not aware that these beds have been regarded as continuous, though they are doubtless indications of a continuous formation. A comparison of fossils from numerous points in the coal measures of the West, shows very conclusively that one or more of these beds of limestone are continuous, or at least that the same association of fossil species occur at so many points as to leave no doubt of a similarity in the conditions of the ocean bed over a wide area now occupied by the coal measures.

One of these bands of shaly limestone, containing throughout the same species of fossils, may be traced from northeastern Ohio, or even from Pennsylvania, through Indiana, Illinois, Iowa, and Missouri, becoming in the latter State, and in the adjoining parts of Nebraska and Kansas, an important limestone formation, and constantly increasing in a westerly direction until it becomes the prominent limestone of the Rocky Mountain range.

According to the report of Captain Stansbury, and from specimens brought by him from the Salt Lake region, we learn that it there forms extensive mountain ranges or at least that it is

* It was from a limestone in the coal measures of Ohio that Dr. Hildreth procured several species of fossils which are described by Dr. Morton in the American Journal of Science, vol. xxix. The *Spirifer cameratus* of that paper appears to be identical with one described by Dr. Roemer as *S. Meusebachanus*, and by the writer as *S. triplicatus*, in Stansbury's report, and the same is referred, with doubt, by Dr. Owen to *Spirifer fasciger* of Keyserling. The species presents much variety in different localities, but a comparison of specimens from Ohio, Iowa, Missouri, Texas, and New Mexico, leads me to infer that they are all of a single species first described by Dr. Morton. It is possible that further comparisons may show the occurrence of two closely allied species, but more extensive collections are required for this purpose.

the most conspicuous rock of the north and south ranges in the vicinity of the Great Salt Lake. The limestone from these localities is a dark-blue, compact rock, often, in specimens, gray and subcrystalline, and sometimes with sparry veins.

This limestone, identifed by its fossils, is found in the collections made near Santa Fé, New Mexico, at the Pecos village, the Mogollan Mountains, at El Paso, upon the river San Pedro, and the numerous other localities. From a sketch and the notes of Dr. Parry, before alluded to, this limestone forms a conspicuous part of some of the mountains along the boundary line. There can be little doubt that the same limestone occurs much further to the southward, and that it constitutes the principal calcareous formation of that part of the country, whether in an unaltered or in a metamorphic condition. It is, as already stated, the limestone traversed by veins of silver lead, from which specimens have been brought in the boundary collection.

The collections of Dr. Roemer, from Texas, indicate very clearly the occurrence of this limestone at the places examined by him; and he gives no figures of species belonging to lower carboniferous limestones.

From the massiveness and compact texture of many of the specimens from the southwest, and the subcrystalline character of others, we are prepared to find that this rock has become much more extensively developed than in the northeast, or even in Missouri or Kansas; and it would appear, also, that the shaly beds which accompany the limestone in these localities and are often more conspicuous than the limestone itself, have diminished so far as to form no striking feature in the far west and southwest. We are not able to learn that it is there ever accompanied by coal, and it is presumed that the shaly and sandy materials associated with the coal, as well as the coal itself, have thinned out in that direction, or become of such tenuity as to be of no importance.

The relations of this limestone to the lower coal measures, in the States bordering the Mississippi river, render its occurrence a subject of interesting economical inquiry. Since we know that the most extensive and valuable beds of coal in the west are of the lower coal measures which lie beneath the upper limestone, they may still be found to underlie the upper carboniferous limestone of the Rocky Mountains, as they do the same limestones in Kansas, Missouri, Iowa, Illinois, and Indiana. Thus far I am not aware that any inquiries of this kind have been instituted in the explorations and surveys already made.

Having thus briefly described the range of the upper carboniferous limestone, we may now take a comprehensive view of its conditions and extent. We find that during the coal period, in the States east of the Mississippi river, thin strata of limestone, or calcareous shale, were deposited. These are charged with brachiopoda, of genera characterizing the carboniferous limestone below the coal measures, though of species distinct and peculiar. So thin and insignificant is this formation, that we can scarcely regard it as the product of a wide and deep ocean. Tracing it westward, however, its importance increases; from being entirely subordinate to the coal measures proper, and scarcely affecting the character of that formation, it becomes a characteristic mass; the calcareous mud mingles with the coal, and the latter becomes subordinate to the limestone and calcareous shales. Still further west it is a vast limestone formation, next in importance to the great calcareous formation below the coal, or lower carboniferous limestone formation.

The conditions favorable to the production of an extensive deposit of marine limestone are

not such as usually accompany the production of coal. In the present instance, the ocean, depositing the great limestone formations previous to the coal period, occupied to a great extent the present area of the coal measures which succeeded. Land plants in excessive growth, estuary or shallow water shells attend the production of the coal and its associated strata. We begin thus to comprehend the truth that, during the period of the great coal formations of the Appalachian, and the Mississippi valley, there existed a broad ocean at the far west and southwest, in which these calcareous deposits were in course of formation; that during the oscillations which we know to have occurred throughout the coal period, there was a time when the whole area became depressed so as to allow the waters of the southwestern ocean to flow over all the coal-measure area, or, at least, as far northward and eastward as the northeastern part of Ohio; and from hence is derived the limestone under consideration. The calcareous bands deposited along the northeastern margin of this ocean, we now find interstratified with seams of coal, and beds of shale and sandstone containing land plants; while, as the waters deepened towards the southwest, the formation exhibits the differences of character which we would necessarily expect to find in an ocean deposit.

The evidence of the existence of this ocean in the far west and southwest, during the coal period, amounts to almost a proof that the conditions of that area, which now constitutes a part of the continent, were never such as to admit of the production of coal plants, and the deposit of such materials as make up the coal measures, at least during the latter part of the coal period. In regard to the earlier part of that period, or the time in which the lower coal measures were formed, we have not, as I conceive, at present, the means of fully deciding what were the conditions in the central and southwestern part of our continent.

OBSERVATIONS UPON THE CRETACEOUS STRATA OF THE UNITED STATES, WITH REFERENCE TO THE RELATIVE POSITION OF THE FOSSILS COLLECTED BY THE BOUNDARY COMMISSION.

The list of fossil species from the localities visited by the Boundary Commission shows so large a number identical with those described and figured by Dr. Roemer in his *Kreidebildungen von Texas*, that we cannot doubt the occurrence of the same beds throughout the whole extent surveyed, as far as the neighborhood of El Paso and Frontera. These collections, made at intervals over so wide an extent, would be likely to give us some representative species from different and successive beds of the formation, should it there exhibit similar subdivisions as are elsewhere known in this formation, in other parts of the country. With the exception of two species, they are all distinct from those known in the cretaceous formation of New Jersey and Alabama, where the fossils have been most carefully studied. They are equally distinct from the species occurring in Nebraska; while those from the last-named region present so many species in common with New Jersey and Alabama, that we cannot doubt the general equivalency of the beds in these distant points. The species known from Tennessee are likewise identical with New Jersey species to a great extent, leaving no doubt as to the exact equivalency of the formation in the two localities.

The cretaceous formation, as known in New Jersey, can therefore be traced by the Atlantic coast to Alabama, and thence into Tennessee, and even southern Illinois; and though not yet followed continuously to the northward, it is nevertheless recognized in Nebraska by numerous identical species of fossils.

When we carry forward our investigations in a southwesterly direction, however, we soon lose, to a great extent, the evidence of identity in the fossils; and in Arkansas the *Exogyra costata*, *Ostrea vesicularis*, and *Trigonia thoracica*, are almost the only species identical with those known on the east of the Mississippi river, and in Nebraska. At the same time, other species occur in considerable abundance, which are of decidedly cretaceous character, leaving no doubt of the existence of that formation, though we have lost the evidences which guide us in more eastern localities.

Since this change in the character of the fossils is quite observable as far north as Fort Washita, in Arkansas; and since the types of the green sand of New Jersey and Alabama extend as far north as Tennessee and Illinois, it is clear that the change is not due to climatic influence or to geographical distance. It would moreover be unreasonable to suppose that such a change in the nature of the sediment had taken place as to destroy within this short distance all the forms of life so well known further east, and replace them with others adapted to the different condition. Indeed, we are not informed that there is any great change in the lithological character of the strata; though it is true that the cretaceous beds of Arkansas, Texas, and New Mexico, (as we judge from the specimens,) are more calcareous than those of New Jersey and Nebraska. But they are not more so than in Alabama, where the "Rotten limestone" attains a thickness of 400 feet, and contains species common to the regions just referred to.

It is not due therefore to difference of latitude, or to a change of conditions in the sediment,

that we have this difference in the organic remains of the formation; but it is doubtless true that this region of the cretaceous formation of the southwest, which has yielded nearly all the fossils, represents a *different epoch* in the *cretaceous period* from those beds further east and in the northwest, of which the organic contents are better known.

The relations of that part of the cretaceous formation, which is developed in Texas and New Mexico, to the same formation as known on the east of the Mississippi river and in Nebraska, becomes a matter of much interest and importance.

The various examinations in Texas and in Arkansas, as well as along several lines of survey, do not give us any sections of these beds showing their relations with other formations, or indications that there may be more than a single member of the cretaceous formation from which all these fossils have been derived.

Before attempting to theorize in regard to the probable cause of this difference in the fossils of the cretaceous strata at these distant points, we may bring together in a general manner the results of investigations made at various points and at different times, which may serve to throw some light upon this question.

In the earlier investigations of the cretaceous formations of New Jersey and other parts of the United States, Dr. Morton subdivided the whole into three groups or divisions.

First Group.—Upper cretaceous strata.

Second Group.—Medial cretaceous strata.

Third Group.—Lower cretaceous strata.

The upper division embraced the Nummulite limestone of Alabama, being especially characterized by the presence of *Plagiostoma dumosum*, *Nummulites Mantellii*, (*Orbitoides Mantelli.*) This rock is now regarded as belonging to the older Tertiary formations.

The medial division was regarded as contemporaneous with the white chalk of Europe.

The lower division embraced the "ferruginous sand deposits of the Atlantic States, extending from Martha's Vineyard to South Carolina and Alabama, and into Mississippi, Arkansas and Missouri."

These strata were at that time regarded as contemporaneous with those which lie between the white chalk and oolite in Europe.

The foregoing subdivisions were proposed by Dr. Morton in some "additional observations" appended to his "Synopsis of the organic remains of the cretaceous group of the United States," and published in the Journal of the Academy of Natural Sciences in 1842. Accompanying this classification of the cretaceous formation is a list of fossils from each of the subdivisions, including all those which had been described up to that period.

Professor Rogers, in his report upon the geology of New Jersey, in 1840, proposed a division of the cretaceous formation of the State into five members. These subdivisions, however useful they may have been topographically, are not accompanied by the palæontological evidence necessary to enable us to determine their value as distinctive groups, or to aid us in a comparison with the sequence in other localities.

More recently the investigations made during the geological survey of the State of New Jersey have thrown further light upon the order of succession, and the lithological character of the members composing the green sand formation of New Jersey. The section given by Professor Cook, which has been verified by borings in several places, leaves no doubt that we have now arrived at a knowledge of the true relations of the different members of this period as

developed in New Jersey; and it is the more interesting since it enables us to show the true position of certain well marked and widely distributed cretaceous fossils, in relation to others which approximate in character to Tertiary types.

The following section gives the expression of all that is at present known regarding the order of succession among the members of the system as they occur in eastern New Jersey.*

	Divisions, lithological characters, etc.	General remarks, sub-divisions, etc.	Characteristic fossils, etc.
VIII	Green sand, 3d or upper bed.	This bed admits of a triple division, the central portion is nearly destitute of fossils, while those of the upper and lower divisions are mostly dissimilar.	
VII	Quartzose sand, resembling beach sand.	This bed is (so far as known) quite destitute of fossils.	
VI	Green sand, 2d bed.	(a) Yellow limestone of Timber creek.....	(a) Characterized by *Eschara digitata*, *Monticulipora* (*Anthophyllum*) *atlanticum*, *Nucleolites crucifer*, *Ananchytes cinctus*, *A. fimbriatus*, Morton.
		(b) A bed of nearly unchanged shells.....	(b) Among the characteristic fossils of this bed are *Gryphæa vomer*, *G. convexa*, and *Terebratula Harlani*.
		(c) Green sand, etc.....	(c) *Cuculles vulgaris* is the most characteristic fossil of the lower division.
V	Quartzose sand, highly ferruginous throughout, and argillaceous in its upper part.	This rock is sometimes indurated or cemented by oxide of iron.	*Exogyra costata*, *Ostrea larva*, *Bellemnitella mucronata*, *Pecten* (*Neithea*) *quinquecostatus*? and many other fossils, mostly in the condition of casts of the interior, or impressions of the exterior.
IV	Green sand, 1st or lower bed.	Several subdivisions may be recognized, depending on the character of the marl, etc.	*Exogyra costata*, *Ostrea larva*, *Bellemnitella mucronata*, *Terebratula Sayi*, (*Gryphæa convexa* and *G. mutabilis*) *Ostrea vesicularis*.
III	Dark colored clay, containing green sand in irregular stripes and spots.		*Ammonites Delawarensis*, *Ammonites placenta*, *A. conradi*, *Baculites ovatus*, casts of *Cardium*.
		Position of beds Nos. 2 and 3 of the Nebraska section.	
II	Dark colored clay.....	At the present time the evidence tends to show that No. 1 of the Nebraska section is represented here by Nos. 1 and 2, and that Nos. 2 and 3 of the Nebraska section are wanting, and would find a place between Nos. 2 and 3 of this section, if existing.	This bed contains large quantities of fossil wood, (no animal remains are known to occur in it.)
I	Fire clay and potters' clay.	.....	This bed contains fossil wood and numerous impressions of leaves, but no animal remains.
	Gneiss.		

Equivalent to Nos. 4 and 5 of the Nebraska section.

In Alabama, according to the report of Professor Tuomey, the cretaceous strata admit of a

* This section has been communicated to me by Professor George H. Cook, of the New Jersey Geological Survey, and gives some additional information beyond that already published in his Geological Report.

three-fold division, in which the upper member consists of the "rotten limestone," the central an arenaceous group, and a lower dark colored clay.

Without at present having the means of exact comparison, it may be inferred that there is a close agreement between the different members of the series in Alabama and New Jersey. The specific identity of many of the characteristic fossils leaves no doubt as to the close similarity of the formation there developed, with the beds in New Jersey, from which a large part of the fossils described by Dr. Morton were obtained. The calcareous part of the formation in Alabama acquires a far greater development than in New Jersey, and appears to be there the principal repository of the fossils of this period.

It is now more than fifty years since Messrs. Lewis and Clark, in their expedition to the Columbia river, brought from the Great Bend of the Missouri river some fossils, which were afterwards identified by Dr. Morton as belonging to the cretaceous formation, and from beds of the same age as the marl or ferruginous sand of New Jersey, Delaware, and Alabama. Subsequently Mr. Nuttall brought some species from the same locality. Dr. Morton, in his Synopsis, (1834,) acknowledges the receipt of *Gryphæa Pitcheri* and other cretaceous fossils of great interest, from the plains of Kiamesha, in Arkansas, from Dr. Z. Pitcher, of the United States army. Dr. Morton also mentions other fossils from the falls of Verdigris river, in the same Territory.

It is nearly twenty years since Mr. Nicollet first visited and explored the country about the sources of the Mississippi and some parts of the Missouri river, as far up as Fort Pierre. The collections made by this gentleman enabled Dr. Morton to designate about sixteen species of cretaceous fossils, half of which were regarded as common to that region, New Jersey, and Alabama. Mr. Nicollet, in his report, has given the following section of the beds of the cretaceous formation upon the Upper Missouri:

D.—A plastic clay deposit, about 200 feet thick, divided into two equal parts by a stratum of carbonate of lime in nodules.

C.—A ferruginous clay, of a yellowish color, containing masses resembling septaria and seams of selenite.

B.—A calcareous marl, generally from 30 to 40 feet thick.

A.—"Argillaceous limestone, containing *Inoceramus Barabini* (?) in great numbers, and very much compressed, and so arranged as to give the rock a slaty appearance."*—(At Dixon's Bluff.)

The importance of these divisions does not appear to have been fully appreciated, or the collection was not sufficient to establish the restriction of species within the limits thus indicated.

In the meantime, the explorations of Lieutenant Frémont, of Lieutenant Abert, of Captain Stansbury, and others, and more extended examinations made under the direction of Dr. D. D. Owen, in his Geological Survey of the Chippewa Land District, have brought to light other cretaceous species from this region;† while the several Pacific railroad surveys have shown the occurrence of cretaceous fossils at various points farther to the south, and at intervals which indicate a continuation of the formation from the Missouri river to New Mexico. More recently, Dr. Evans, who had previously visited this region as assistant in the geological survey of Dr.

* The species of Inoceramus in Mr. Nicollet's collection, in a condition here described, was subsequently identified by me as the same with that brought by Captain Frémont from the Smoky Hill river.—(See report, p. 310.)

† In his report Dr. Owen does not notice the subdivisions of Mr. Nicollet's section; and the cretaceous species figured and described appear all to have been derived from a single bed of the formation.

Owen, has collected, and with Dr. B. F. Shumard, has described, several new cretaceous species from the same region.

In 1853, Messrs. F. B. Meek and F. V. Hayden made an extensive collection of the fossils of the cretaceous formation upon the Missouri river in Nebraska; and among these somewhat more than thirty new species, a number equal to all the cretaceous species before known as occurring in that region. These species were described by the writer, in connexion with Mr. Meek, in the Memoirs of the American Academy of Arts and Sciences.* A section of the cretaceous and tertiary strata of the Missouri river and the Mauvaises Terres, compiled from the notes of Mr. Meek, made upon the ground and verified by subsequent examination of the fossils, likewise accompanied the paper just noticed, on page 405 of the same volume.

The order of succession among the beds constituting the cretaceous formation, and their lithological character there established, are as follows:

Section of the members of the cretaceous formation, as observed on the Missouri and thence westward, including the tertiary beds of the Mauvaises Terres.

Tertiary formation.....			Indurated clays, beds of sandstone, conglomerate, limestone, &c., containing remains of Mammalia and Chelonia, with a few species of fresh water shells.
Cretaceous formation of Nebraska.	Equivalent of Nos. III, IV, V, and VI of the New Jersey section.	C and D of Nicollet's section.	V.—Arenaceous clay, passing into argillo-calcareous sandstone; 80 feet thick.
			IV.—Plastic clay, with calcareous concretions, containing numerous fossils; 250 to 300 feet thick. (This is the principal fossiliferous bed of the cretaceous formation upon the upper Missouri.)
		A and B of Nicollet's section.	III.—Calcareous marl, containing *Ostrea congesta*, *Inoceramus problematicus*,† scales of fishes, &c.; 100 to 150 feet thick.
			II.—Clay containing few fossils; 80 feet thick.
			I.—Sandstone and clay; 90 feet. The probable equivalent of Nos. I and II of the New Jersey section.
Carboniferous formation.....			I.—The sandstone, No. I of section, rests upon buff colored magnesian limestone of the upper carboniferous period.

In this section Nos. II and III correspond to A and B of Mr. Nicollet's section, while the sandstone, No. I, was either overlooked by him, or may have been referred to the carboniferous strata.‡

The divisions C and D of Mr. Nicollet's sections are subdivisions of Nos. IV and V of our section, or probably of No. IV alone, since No. V is not known to occur on that part of the

* "Description of New Species of Fossils from the Cretaceous Formation, by James Hall and F. B. Meek. Memoirs of the American Academy of Arts and Sciences, vol. V, new series.

† In a subsequent exploration of this region Dr. Hayden discovered *Inoceramus problematicus* in this bed, in precisely the same conditions and in a rock identical with that in which the specimens occur brought by Captain Frémont from the Smoky Hill river, and by Captain Stansbury from between the Big and Little Blue rivers.

A careful comparison of *Inoceramus fragilis*, from bed No. 2, Nebraska section, (Hall and Meek, Memoirs Amer. Acad., vol. V, new series, page 388,) has satisfied both Mr. Meek and myself that it is identical with *I. problematicus*, the specimen described being the young of that species. The young specimens of the latter shell from Arkansas and Smoky Hill river present no essential differences from those of Nebraska.

Dr. Hayden has likewise made extensive collections in other parts of the Nebraska cretaceous and tertiary formations during the past two years. The new species of these collections have been described by Messrs. Meek and Hayden, in several papers published in the proceedings of the Academy of Natural Sciences of Philadelphia. These explorations, with the extensive collections of fossils, have served to sustain the correctness of the order of succession among the subordinate members of the series as given in the section above; indicating, however, that the beds Nos. II and III, as well as Nos. IV and V, may in some localities merge into each other; while the limits between Nos. III and IV remain well marked throughout the region explored.

‡ From the fact that Mr. Nicollet remarks, (page 35,) that the part of stratum A above water, on the day of his "examination, was three feet," we may infer that the sandstone No. I was not seen by him.

Missouri which was examined by Mr. Nicollet. Although admitting of several subdivisions from changes in lithological character, the beds of No. IV do not present any groups of fossil species restricted within the physical or lithological limits designated, and they can scarcely, therefore, be regarded as of importance in the classification of the formation, or valuable in tracing the limits of its members over a wide extent of country.

The subdivisions A and B, corresponding to Nos. II and III of our section, are more important; and, although yielding so few fossils on the Missouri, they become well marked in other parts of the country. The "*Inoceramus Barabini*," represented by Mr. Nicollet as found in great numbers at Dixon's Bluff, very much compressed and so arranged as to give the rock "a slaty structure," is undoubtedly the *Inoceramus problematicus*, which is known to occur in this position, and does not occur in the higher beds of the formation upon the Missouri, so far as known at the present time. The *Ostrea congesta*, and all the other fossils from beds Nos. II and III of the section, are unlike species from New Jersey or Alabama, and appear to be restricted to these beds. At the same time the species identical with or analogous to species of New Jersey and Alabama occur in beds Nos. IV and V, which may perhaps be regarded as subdivisions of one group.

We are warranted, therefore, in referring the beds above No. III to the fossiliferous beds of New Jersey and Alabama, while we have yet no evidence that Nos. II and III do occur in either of these States.

The beds Nos. III, IV, V, and VI of the New Jersey section, given on a preceding page, correspond in their fossils with Nos. IV and V of the Nebraska section; leaving the third green sand of New Jersey (No. VIII of that section) unrepresented in the northwest, so far as known at the present time.

The New Jersey beds, Nos. I and II, which are marked only by fossil wood and impressions of leaves, appear to be represented by No. I of the Nebraska section, judging from the general character of the remains yet known in the two. Should this inference prove to be correct, the beds Nos. II and III of the Nebraska section will hold a position between Nos. II and III of the New Jersey section; but I do not regard this question as yet determined.

The relations of the beds Nos. II and III of the Nebraska section, and their characteristic fossils, become very important when we undertake the comparison of the cretaceous formation of Texas and New Mexico with that of Nebraska, Alabama, and New Jersey.

The wide extent and persistence of *Inoceramus problematicus*, and its restriction to beds Nos. 2 and 3, and their equivalents, so far as at present known, render it of great value in determining a geological horizon. This species was first brought from the Missouri river by Mr. Nicollet.* It was collected by Captain, now Colonel, Frémont† upon the Smoky Hill Fork, where it occurs in a gray or buff color, and also in a blue, slaty limestone in great numbers, and being extremely flattened, gives to the rock a slaty structure, as described by Mr. Nicollet.

* Report on the Upper Mississippi River, by J. N. Nicollet, 1853.

† Report of the Exploring Expedition to the Rocky Mountains, by Captain J. C. Frémont, 1854. Appendix, geological formations and organic remains, by James Hall. At the time of my examination of Captain Frémont's collections, I had an opportunity of comparing the specimens of *Inoceramus* with those brought from the Missouri by Mr. Nicollet, and identified the specimens in the two collections as the same species. The collections of Mr. Nicollet were, at that time, broken up, and I saw some of them in Professor Ducatel's possession, in Baltimore, and others in Georgetown. The information given me was, that they were from near the Great Bend of the Missouri; but by the examination of Mr. Nicollet's report, it is very clear, from his statements, page 35, that this *Inoceramus* occurs at Dixon's Bluff, and not at Great Bend, since Mr. Nicollet refers to the former locality as exhibiting the base of the formation.

The specimens collected by Lieutenant Abert,* at Poblason, are doubtless of this species, and are referred by Professor Bailey to the same species as those of Frémont's report. The same species was brought by Captain Stansbury† from between the Big and Little Blue rivers, in precisely the same conditions, and in a similar rock. In 1854 I received specimens of the same fossil, collected at several points on the Arkansas, by Colonel Frémont, during his later expedition. These occur in part in a bluish, or dull lead-colored, argillaceous limestone, and others in a gray or buff-colored limestone.

Dr. Schiell collected this species of *Inoceramus* at the bend of the Arkansas river; and it is mentioned by Dr. Roemer as occurring near New Braunfels, in Texas. Dr. F. V. Hayden has, more recently, brought the same from the bed No. 3, Nebraska.

In Arkansas, this fossil is collected from the same localities, and apparently in the same position from which are obtained numerous species of *Echinoderms*, *Gryphæa Pitcheri*, and other fossils of species yet unknown in Nebraska, or in any localities east of the Mississippi river.

Fragments of the same species of *Inoceramus* occur in an argillaceous limestone, among the collections of the Boundary Survey, from the basin of the Rio Grande. In the same connexion occur several *Echinoderms* of species identical with those from Arkansas—*Gryphæa Pitcheri*, *Ammonites Texanus*, etc.

The collections of the Pacific Railroad Surveys, which have been placed in my hands for examination, show that *Ostrea congesta* was collected by Mr. Marcou, from a point three miles north of Galisteo, between Fort Smith and Santa Fé.‡ This fossil, in Nebraska, is associated with *Inoceramus problematicus*. In the same collection, and from the same locality, near Galisteo, there were specimens of a slaty limestone containing fragments of *Inoceramus*, which, although not identified at the time, is probably the *Inoceramus problematicus*. Thus we have abundant evidence of the distribution of this species from Nebraska to New Mexico.

The section already established for the cretaceous strata upon the Missouri, as given above, and the occurrence of *Inoceramus problematicus* in the beds Nos. 2 and 3 of that section, serve to fix the place of that fossil in the series in reference to the other beds constituting the cretaceous formation in Nebraska. From the analogy of the beds Nos. 4 and 5, and the identity of several important species of fossils with those of New Jersey, Alabama, and Tennessee, we may regard the position of this fossil as determined in reference to the members of the series which occur in these States, this species having never been found, so far as we are aware, in either New Jersey, Alabama, or Tennessee. Thus this fossil becomes one of the best guides for the identification of certain strata in the cretaceous system of the United States.

In a paper recently published in the proceedings of the Academy of Natural Sciences, by Messrs. Meek and Hayden, speaking of the geographical distribution of the cretaceous fossils, they refer to the well known species *Ammonites placenta*, *Scaphites Conradi*, *Baculites ovatus*, and *Nautilus Dekayi*, as being common to the central or upper portions of New Jersey cretaceous strata, to the rotten limestone of Alabama, and to beds Nos. 4 and 5 of Nebraska. Alluding to the position of the cretaceous beds of the southwest, they remark:

"At the same time the total absence of the above named fossils, and, indeed, so far as we yet

* Report on a Geographical Examination of New Mexico, by Lieutenant J. W. Abert, 1848. Notes concerning the minerals and fossils, by Professor J. W. Bailey, page 547. See note [pp. 117, 118] of the present report.

† Exploration of the Valley of the Great Salt Lake, by Captain Howard Stansbury, 1852. Appendix, geology and palæontology, by James Hall; page 402.

‡ See Pacific Railroad Reports; survey of the thirty-second parallel; Chapter IX, page 103.

know, of all the other species of the lowest and upper two Nebraska Cretaceous formations in the rocks from which Roemer and others collected so many species in Texas, and other southwestern localities, renders it highly probable that if the latter occur at all in Nebraska, they must be represented by the beds Nos. 2 and 3 of our section. This conclusion is further strengthened by the fact that the only Nebraska species yet found in the southwest, so far as we know, are *Inoceramus problematicus* and *Ostrea congesta*, both of which are unknown in the northwest, excepting in the above named beds, and are mainly restricted to the latter. The well marked specific characters of these two fossils and their limited vertical range, together with their extensive geographical distribution, render the bed in which they occur a horizon of the highest importance in the identification of strata at remotely separated localities in these far western Territories.

"That these beds, or formations of the same age, are widely distributed over a vast area of country, extending from near the great bend of the Missouri, in latitude 44° 15′, longitude 99° 20′, westward to, and perhaps beyond, the eastern slope of the Rocky Mountains, and far south into Texas and New Mexico, is highly probable, from the occurrence of their characteristic fossils at many widely separated localities in this region. At any rate we know, from information obtained through Mr. Henry Pratten, of the geological survey of Illinois, that *Inoceramus problematicus* is found in a light-colored limestone overlying a red sandstone on Little Blue river, a tributary of Kansas river. Colonel Frémont also collected specimens of the same shell from a similar rock on Smoky Hill river, in latitude 39°, longitude 98°, and at other localities between there and the rocky mountains.* More recently Lieut. Abert found the same, or a closely allied species, at a point as far southwest as latitude 35° 3′ N., longitude 107° 2′ W., and apparently on the western declivity of the anticlinal axis of the Rocky Mountains.† Roemer likewise collected in Texas specimens of a shell he refers to *Inoceramus mytiloides* of Mantell, which is considered identical with *I. problematicus* of Schlotheim. In addition to this we have seen, in Mr. Marcou's collection, specimens of *Ostrea congesta*, from Galisteo, between Fort Smith and Santa Fé, where it probably holds the same geological position as the so-called *Gryphæa dilatata*.

"The formations from which the above named fossils were obtained in the southwestern Territories, appear, from the statements of the various explorers of that region, to repose on a series of red, yellow, and whitish sandstones, and various colored clays, which are referred by Mr. Marcou to the Jurassic and Triassic systems. These lower beds, we think, are represented wholly or in part in Nebraska, by our formation No. 1, which, as previously stated, we regard as probably belonging to the lower part of the Cretaceous system, though it may be older."

Finally, in reference to the relative position in the series of a large part of the cretaceous fossils of the Boundary Survey, I have already, in a previous communication, stated that I regard them as occurring in the same geological horizon with the beds of Smoky Hill river, Poblazon, &c. I am now prepared to fix their position in the same parallel with beds Nos. 2 and 3 of the Nebraska section, and below those beds in New Jersey and Alabama, which contain *Baculites ovatus*, *Nautilus De Kayi*, and *Ammonites placenta*.

The reasons for this conclusion are obvious from what has preceded. The most conspicuous known fossils of beds 2 and 3 in Nebraska, are found in Arkansas and elsewhere, associated

* See Prof. Hall's figures and remarks in Frémont's report, p. 174, pl. 4.

† Lieut. Abert's report of explorations in New Mexico and California, p. 547.

with many of the species of the Boundary Survey collections, and from the persistence of *Inoceramus problematicus*, and the almost uniform character of the rock in which it occurs, from Nebraska to New Mexico, we can have no doubt that the beds containing this fossil everywhere occupy the same horizon.

The collections from the southwest have never furnished specimens of the cephalopods enumerated above, which characterize the upper cretaceous strata, and the few fossils which are common to Texas and New Mexico and New Jersey, render it probable that the higher beds of the formation have thinned out in that direction to a degree which renders them subordinate in importance to the lower beds of the system. The few specimens identical with species known in New Jersey, Alabama, and Tennessee, appear, from their color and the character of the associated rock, to have been obtained in a different bed from that of the greater number of specimens in the collection, which are associated with a more calcareous rock. At the same time, the absence of sections of strata leaves us without positive information in this respect.*

In the present state of our knowledge, it would appear that the beds 2 and 3 of the cretaceous formation of Nebraska have gradually increased in thickness and importance in a southwesterly direction, and, at the same time, have become more fossiliferous. In tracing the same beds through Arkansas, we find, in addition to the *Inoceramus problematicus*, and associated with that fossil, *Holectypus planatus*, *Toxaster elegans*, *Holaster simplex*, *Cardium multistriatum*, *Inoceramus confertim-annulatus*, *Gryphæa Pitcheri*, and others, which occur also among the Boundary collections. These facts clearly show that the beds have become much more fossiliferous than on the Missouri, or on the Kansas and Blue rivers, and we must regard the greater part of the Boundary collections as derived from the horizon of these beds.

From the great vertical range of the characteristic cephalopods, above enumerated, in New Jersey, and their wide geographical distribution, and from the marked distinction in the types of fossils holding the lower position, we shall probably find it convenient to subdivide the cretaceous formation into three great groups:

3. The upper division, comprising the first and second marl beds of New Jersey, with the intermediate ferruginous sand, and the clay below the first greensand bed, (Nos. III to VI of the section,) parallel to the beds 4 and 5 of Nebraska.

2. The middle division, equivalent to the beds 2 and 3 of Nebraska, and the calcareous beds of the southwest, Arkansas, Texas, and New Mexico, containing the numerous *Echinoderms*, *Inoceramus problematicus*, *Gryphæa Pitcheri*, *Hippurites*, *Caprina*, *Nerinea*, *Ammonites Texanus*, and numerous other fossils.

1. The lower division, represented by No. 1 of Nebraska, and probably equivalent to the lower clay beds of New Jersey, in which the only fossils yet known are of vegetable origin.

It is not unlikely that the medial division may prove, in many localities, to be divisible into distinct beds beyond those recognized in Nebraska; or, that as the formation expands to the southward, other beds not known on the Missouri will come in, or that the two there known will be found to become much modified in character.

* A single observation in the notes accompanying the specimens leads me to infer that *Exogyra costata*, and one or two species besides, were collected from a higher position in the cliff than the other fossils. Since, however, it is probable that many species, not known in the same association in New Jersey and Alabama, may occur in connexion with *Exogyra costata* in the southwest, we cannot at this time separate the species belonging to the upper and lower divisions of the formation.

I learn, also, from Dr. Parry, since these pages were written, that he regards the bed containing *Exogyra costata* and some other species, as holding a higher position than the calcareous beds of Leon Springs, and other localities along the route.

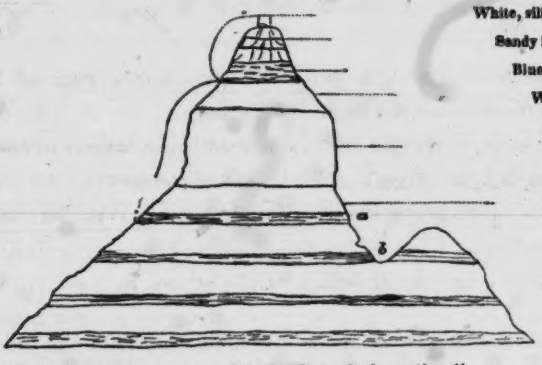
From the facts before us it appears that Nos. 4 and 5 of the upper division, which are so largely developed on the upper Missouri, become gradually attenuated towards the southwest, and lose in a great measure their distinctive fossils.

Although the specimens in the boundary collections do not clearly indicate the occurrence in that region of the sandstone No. 1 of the Nebraska section, it is nevertheless quite certain, from other collections in my possession, that the same rock occurs on the Arkansas river, possessing the same characters as in Nebraska.

Dr. Shumard, in his examinations in Arkansas, speaks of a sandstone which clearly holds the place of No. 1 of our section. On page 181 of report, before cited, he says: "Passing this range, the sandstone again reappears, and constitutes the prevailing rock to within a short distance of Fort Washita, where it disappears, and is succeeded by strata of the cretaceous period." Although not recognized by Dr. Shumard as a member of the cretaceous formation, still it holds, in regard to the beds in Arkansas, equivalent to Nos. 2 and 3 of Nebraska, the same relative position as the sandstone No. 1 on the Missouri river.*

The observations made in the course of the boundary survey, and in all the other surveys in the southwest, show the occurrence of various colored sandstones and clays below the fossiliferous beds identified, as above, with Nos. 2 and 3 of the Nebraska section. Indeed, we have evidence, from numerous observations, of the occurrence of a similar sandstone at so many points from Missouri to New Mexico as to render it certain that the formation is continuous over this wide extent of country.

The observations of Mr. Marcou, on the line traversed by one of the Pacific railroad surveys, induced him to regard these sandstone as of older date than the cretaceous formation. In a section of Pyramid Mountain given by Mr. Marcou, (*Bulleten Soc. Geol. de France, tome* 12, *p.* 878,) he recognizes a series of sandstones and clays beneath limestones which are of unquestionable cretaceous age.



"*a.* Bed of variegated marls in contact with the Jurassic formation."
"*b.* Alternations of calcareo-argillaceous marls of variegated colors—red, green, and white."
"*c.* Bed of *Gryphæa dilatata* and of *Ostrea Marshii*."†

* I believe that Dr. B. F. Shumard regards this sandstone, in part, or altogether, as of carboniferous age; but it is difficult to understand these relative positions, since in numerous localities, from the Missouri river to Texas, the upper carboniferous limestone is the highest determined carboniferous rock, and underlies the sandstone No. 1 of the Nebraska section.

† These explanations of the section quoted above are those given by Mr. Marcou. The designations at the right hand are those given by him in the text accompanying the section.

Having examined the specimens in Mr. Marcou's collection from this locality, I have no hesitation in saying that the specimens labelled by him as *Gryphæa Tucumcarii* (*G. dilatata*, var. *Tucumcarii*, *Bul. Soc. Geol. de France*, *tome* 12, *pl.* 21) are the *Gryphæa Pitcheri* of Morton, and present no features, either in form, characters, condition of preservation, or otherwise, which can serve to distinguish them from *Gryphæa Pitcheri*, in the boundary survey collections, from strata forming a continuation of the Llano Estacado.*

In the section of Pyramid Mountain given by Mr. Marcou, the exhibition of the sandstones and clays beneath the limestone, with *Gryphæa Pitcheri*, is extremely interesting, as giving the succession of beds, with lithological character, more in detail than has elsewhere been published from that region.

For the purpose of comparison, I subjoin some detailed sections made by Mr. Meek, in 1853, upon the upper Missouri, and which are collectively merged in the sandstone No. 1 of our section of the cretaceous formations, as already given.

Section at the mouth of Big Sioux river.

Partially indurated, silicious clay, or marl, of a slightly yellow color, and showing scarcely any lines of stratification. Slope of 60 feet of modern or bluff formation.

Part of No. 1, *section of Nebraska cretaceous formation.*

1. Soft, yellow sandstone, with vertical veins and joints filled with silicious oxide of iron; also, hard, horizontal seams, containing much iron, with casts of *Pectunculus Siouxensis*: 10 feet.

2. Large, concretionary masses, 8 to 10 feet long, and 6 feet thick, consisting of hard, fine-grained sandstone, with perhaps some calcareous matter, laminated on the weathered surfaces: 6 feet.

3. Soft sandstone, like that above, with horizontally arranged concretions of siliceous oxide of iron, which are often hollow.

The three lower divisions of sandstone constitute the upper part of No. 1 of the Nebraska section. They were not seen in actual contact with beds of No. 2; but, from their position and dip relative to the other beds, there can be no doubt of the relations of the two. Subsequently, Dr. Hayden has seen the beds of Nos. 1 and 2 in actual contact on the Big Sioux river.

At a point twenty-five miles below Sergeant's Bluff there is an exposure of about 100 feet, consisting of beds of sandstone and clay, which present great irregularity in bedding, some of the strata rapidly expanding in one direction, while others thin out in the opposite direction.

Section on the right-hand side of the Missouri river, twenty-five miles below Sergeant's Bluff.—Successive beds, or strata, forming part of No. 1, *Nebraska section of cretaceous formation.*

1. A bed of dark-gray clay, alternating above and below with soft sandstone seams. The middle mostly clay; 6 feet.

2. Light, yellow clay, passing downwards into a very soft, gray sandstone; 5 feet.

3. Very dark clay, with fragments of carbonized wood; 1½ feet.

* The specimens from Pyramid Mountain are figured in the Report of the survey of the 35th parallel, and those of the boundary survey will be found in the present volume.

4. Gray, indurated clay, or marl, with pieces of carbonized wood; 4 feet.

5. Dark seam, like No. 3; 8 inches.

6. Clay, like No. 4; 3 feet.

7. Gray sandstone, with fragments of carbonized wood; 2 feet.

8. Very dark gray clay, sometimes black, and containing much organic matter in the lower part, crystals of selenite, etc.; 10 feet.

9. Gray clay, with many fragments of carbonized wood; harder concretions of the same clay, containing carbonized wood; 30 feet.

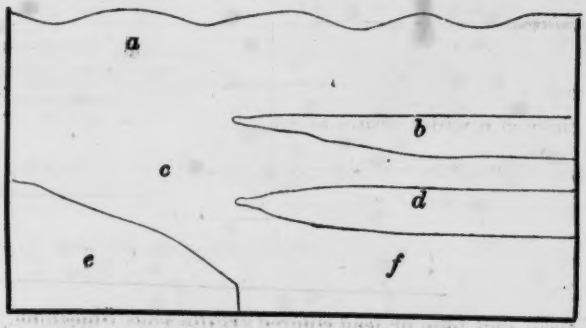
10. Gray sandstone, with pieces of carbonized wood; 2 feet.

11. Gray clay, with thin, wedge-shaped masses of hard bituminous coal, or lignite, and round lumps of sulphuret of iron.

Slope to river-level 30 or 40 feet, in which no beds, in place, were seen.

Many of the beds noted in the above section are seen to thin out entirely, or wholly to change their character in the same bluff within a distance of not more than fifty yards; while others, so thin and obscure as to attract no attention, are seen to increase to a much greater thickness in a very short space; while about two hundred yards below where the above section was made, the same line of bluff passes wholly into a soft, heavy-bedded sandstone, which breaks into large, columnar masses from the top to the base of the cliff.

The following sketch gives an example of the irregularity of the stratification in these bluffs of sandstone and clay:



a. Soft, heavy bedded, yellow sandstone, with pieces of carbonized wood.
b. Dark, almost black, slaty clay, with much carbonized matter.
c. Gray sandstone, with specks of carbonized wood.
d. Hard, reddish sandstone.
e. Indurated gray clay, weathering to a light reddish hue.
f. Sandstone like the upper bed.

These are exhibitions of isolated exposures of the sandstone, clay, etc., constituting No. 1 of the Nebraska section, and which, from its relative position to certain fossiliferous beds, underlies the calcareous strata containing *Gryphæa Pitcheri*, and its associated fossils. This sandstone (No. 1) will include, at least, all that portion of the Pyramid mountain on the left hand side, marked in the diagram 1, while the blue clay, sandy limestone, and white, silicious limestone, represent, as we believe, the beds Nos. 2 and 3 of Nebraska; and this inference is deduced from the facts already stated, that these calcareous beds of the Llano do elsewhere contain the association of fossils characteristic of the horizon of Nos. 2 and 3, which we clearly

trace from Nebraska to New Mexico, and which are likewise, over a large part, or the whole distance, underlaid by sandstones, etc.

With regard to the two hundred feet of sandstones and clays below *a* of the Pyramid mountain, these may be a distinct formation, or they may be a part of the same formation as the beds above. Of all the collections yet examined from the southwest, not a single fossil from beds below those containing *Gryphæa Pitcheri*, and its associated fossils, has come under my notice. We are, therefore, without the means of identification at the present time.

The sandstones of the northwest have a great development, and it is not probable that we yet know their full thickness or their relations throughout. The collections made by Dr. Hayden, at the mouth of the Judith river,* contain a single genus, *Hettangia*, which, in Europe, is considered as restricted to the Liassic epoch. This, however, is associated with cretaceous types, and though there is some evidence in favor of a reference to the Jurassic period, we have not satisfactory proof.

The results at which we have arrived in regard to the identity of the western and southwestern cretaceous formations, may be more clearly appreciated by a comparison of sections of the upper Missouri and of the same formations on the line of the Boundary Survey.

Section of the Llano Estacado and the prolongation of the same beds to the southwest.

4. Tertiary sandstone, conglomerates, etc., with clays and impure limestones.

3. Dark colored, argillaceous limestone, frequently composed largely of broken shells, and containing *Exogyra costata*.

2. Yellow, or buff colored limestone, arenaceous limestone, clays, etc., with *Inoceramus problematicus, Gryphæa Pitcheri, Ammonites Texanus, Toxaster Texanum, Pyrina Parryi*, etc.

1. Sandstones and clays of a white, gray, or red color, containing few or no fossils.

Section of the beds seen on the Missouri river from Dixon's Bluff to Fort Pierre, and thence to Mauvaises Terres.

4. Tertiary sandstones, conglomerates, argillaceous limestone, clay, etc.

3. Light colored calcareous clay, and dark colored astringent clay, with nodules of limestone.

2. Gray or buff colored, and blue or lead colored argillaceous limestone, clay, etc., containing *Inoceramus problematicus, Ammonites*, etc.

1. Sandstones and clay, white, gray, or brown, in irregular and unequal alternating beds, containing few fossils beyond fragments of carbonized wood.

I can, therefore, only regard the sandstone of the southwest, or at least a large part of it, as identical in age and a prolongation of the formation No. 1 of Nebraska, and which, from the evidence of its cretaceous character and the absence of any evidence to the contrary, I refer to the cretaceous period.

* The formation at the mouth of the Judith river, containing a group of fossils quite distinct from any heretofore described, has been referred by Messrs. Meek and Hayden, provisionally, to No. 1 of the Nebraska section, from its general lithological analogy, and from position; but at that point the beds 2 and 3 are wanting, these fossiliferous beds lying immediately below No. 4 of the section.

REMARKS UPON THE TERTIARY FORMATION.

In addition to the Eocene marine tertiary fossils of the Boundary collections, there are numerous specimens of regularly stratified sandstone, conglomerate, clay, etc., which are referrible to the tertiary period. The relations of the beds of these different series and their great thickness indicate that they belong to a system of deposits having a wide extent in that part of the country from which the specimens were derived. The mineral aspect of the specimens, the association of clays, sandstones, and conglomerates, show a close similarity with the tertiary formation of the Mauvaises Terres of Nebraska. Further explorations, collections, and comparisons are certainly necessary before this identity can be fully established; but the numerous intermediate explorations, from the Missouri river to the Mexican boundary line, indicate the occurrence of similar formations along the entire distance. The collections from the tertiary basin east of the Cordilleras likewise present specimens of lithological aspect and conditions so similar to those of the Rio Grande on the east, that there would appear to be some relation between the formations at these distant points.

The tertiary materials in the collections do not appear to me sufficient to furnish more than grounds for a probable inference regarding the identity of the formations, and in the almost entire absence of fossils from the western basin, it might be unwise to express any positive opinion regarding the equivalency of these beds.

Without possessing the means of a detailed section of the successive beds along the line of the boundary survey, we are able, from the specimens of rocks and fossils in the collection, to present the order of succession and general features of the formations and their relative position.

The following section will serve to show the order of succession and relative age of the formations crossed by the Boundary survey:

TERTIARY FORMATION.

Tertiary formations on the west coast, probably of Miocene age.

Tertiary formations east of the Cordilleras, consisting of beds of sandstone, sand,* conglomerates, etc., with subordinate beds of sandstone. Formations in the valley of the Rio Grande, consisting of sandstone and conglomerate, with their calcareous beds, resembling in many respects the tertiary formations of the Mauvaises Terres in Nebraska.

Calcareous beds, with marine fossils of the Eocene tertiary, apparently underlying unconformably the preceding strata.

CRETACEOUS FORMATION.

Argillaceous beds, containing *Exogyra costata*, etc.

Calcareous beds of a buff color, and similar beds of a lead color, with beds of white limestone, containing *Gryphæa Pitcheri*, *Cardium multistriatum*, *Toxaster*, *Holectypus*, *Cyphosoma*, *Pyrina*, *Ammonites Texanus*, *Hippurites*, *Caprina*, *Nerinea*, etc.

Sandstone of various colors, white, brown, red, etc., with beds of clay, etc.

CARBONIFEROUS FORMATION.

Upper carboniferous limestone, containing *Spirifer cameratus*, *S. lineatus*, *Terebratula subtilita*, and other fossils of the age of the coal measures. Perhaps, also, some other members of the coal measures, represented in the altered sandstones and slates of the collection.

*The drifting sands of the southwest, like those of the north, appear to be derived from the sandstones of the tertiary period

DEVONIAN AND SILURIAN FORMATIONS.

The specimens referrible to strata of this age are few, and these are in such condition as to give little satisfactory information regarding the rocks in place.

NEWER IGNEOUS AND METAMORPHIC ROCKS.

Igneous and metamorphic rocks of the Limpia, Guadaloupe, and Organ mountains, Sierra Madre, etc., which are of modern origin.*

OLDER METAMORPHIC ROCKS.

Metamorphic rocks of Silurian and Devonian age, forming the range of the Cordilleras and the isolated mountains in the great plain on the east of that mountain chain.

* The materials which appear as the result of igneous and metamorphic action, may be derived from rocks of the coal measures and from older formations, as well as from those of more recent date. But from all we know of the character of metamorphic, silurian, devonian, and carboniferous strata elsewhere, those here referred to do not possess the same characters and do not belong to the same period of metamorphism.

DESCRIPTIONS OF CRETACEOUS AND TERTIARY FOSSILS.

BY T. A. CONRAD.

The organic remains in the collection of the Boundary Survey are chiefly cretaceous shells, which I have carefully compared with the Alabama and New Jersey species; and out of more than one hundred species in Roemer's and the Survey collections, I can find only two that may be considered identical with New Jersey species. These are *Exogyra costata* and the *Ostrea vesicularis* of Lam., which is at least a marked variety, termed *ancella* by Roemer. D'Orbigny places some of Roemer's Texan species in the same division to which he refers all the New Jersey species, the Senonian stage; yet I think there is sufficient evidence that the cretaceous strata of Texas are not exactly synchronous with those of New Jersey, or of Alabama, while those of the latter State appear to form a passage or intermediate stage between the cretaceous strata of the two former states, which, besides the *Exogyra* and *Ostrea* above mentioned, have four other species in common, viz: *Gryphæa Pitcheri*, *Trigonia thoracica*, Morton, *Baculites anceps*, and *B. asper*.

Among these interesting fossils, those from Leon Springs are conspicuous for variety and beauty, and unequivocally mark the cretaceous period. There is not the slightest trace of the Jurassic or any formation older than the grand epoch of the chalk. A few interesting fossils from near the mouth of Puercos river are imbedded in a white, chalky limestone, and, with the exception of *Ammonites Texanus*, are peculiar to this locality, in the present state of our collections. There is a specimen of flint from Leon Springs of the horn-shaped form so common in the chalk of Europe.

A few Eocene shells collected by Mr. Schott, of the age of the Claiborne formation, prove that Eocene strata occur in western Texas.

Eocene species.

Cardita planicosta, Arroyo Las Minas, between Eagle Pass and Leon.
Corbula nasuta, Con.
Cytherea Nuttalli, Con.
Cassidula alveata, Con.
Volutilithes Sayana, Con.
Natica limula, Con.

Cretaceous fossils from Oak Creek, Texas, collected by Arthur Schott.

Ammonites Texanus, Roemer, near Puercos river.
Nerinea Schotti, Con., near the mouth of Puercos river.
Caprina occidentalis, Con., near the mouth of Puercos river.
C. planata, Con., Oak creek, near Puercos river.
Hippurites? n. s., near the mouth of Puercos river.

Cretaceous fossils from between Rio San Pedro and Rio Puercos, collected by A. Schott.

Rostellaria? collina, Con.
R.? Texana, Con.
Natica collina, Con.
N. Texana, Con.
Buccinopsis Parryi, Con.

Cretaceous fossils from between El Paso and Frontera, collected by Colonel W. H. Emory.

Exogyra Matheroniana, D'Orbigny.
Gryphæa Pitcheri, Morton.
Cardium (Protocardia) Texanum, Con.
Trigonia Emoryi, Con.
Neithea Texana, (*Pecten*, Roemer.)
N. occidentalis, Con., (*quadricostata*, Roemer.)
Plicatula incongrua, Con.
Arca subelongata, Con.

Cretaceous fossils from Leon Springs, collected by Colonel W. H. Emory.

Exogyra Matheroniana, D'Orbigny.
E. arietina, Roemer.
E. læviusscula, Roemer.
Gryphæa Pitcheri, Morton.
Trigonia Texana, Con.
Lima Leonensis, Con.
Neithea filosa, Con.
N. Texana (*Pecten*, Roemer.)
N. occidentalis, Con.
Cardium multistriatum, Shumard.
Arcopagia Texana, Roemer.
Cardium Sancti-sabæ, Roemer.
Capsa Texana, Con.
Terebratula Choctawensis, Shumard.
Caprina crassifibra, Shumard.
Turritella Leonensis, Con.
Natica, ———.
Hamites larvatus, Con.
Ammonites flaccidicosta, Roemer.
A. Texanus, var. Roemer.
Cyphosoma Texanum, Roemer.
Pyrina Parryi, Hall.
Holectypus planatus, Roemer.
Toxaster Texanum.
Turbinolia Texana, Con.

Cretaceous fossils from Jacun, 3 miles below Laredo, collected by A. Schott.

Inoceramus Crispii, Mantell.
I. Texanus, Con.
Ostrea crenulimargo, Roemer.
Exogyra costata, Say.
Dosinea, (imperfect casts.)
Turritella (casts.)
Natica, (casts.)

Cretaceous fossils from Lepan Hills, collected by A. Schott.

Exogyra arietina, Roemer.
Terebratula Wacoensis, Roemer.
Neithea Texana (*Pecten*, Roemer.)
Cardium congestum, Con.
Ammonites Texanus, Roemer.
Hemiaster Texanus, Roemer.
Holectypus planatus, Roemer.

Of the above species *C. congestum* was collected on the Rio San Pedro, and all the others on the Rio Bravo del Norte.

Cretaceous? fossils from Dry Creek, Mexico, collected by A. Schott.

Ostrea cortex, Con.
O. multilirata, Con.

Cretaceous fossils from various localities, collected by A. Schott.

Neithea Texana (*Pecten* Roemer.) San Pedro River, mouth of painted caves; valley of the Rio Bravo, a few miles below the mouth of Rio San Pedro; upper valve of the same, near the mouth of the San Pedro.

Terebratula Wacoensis, Roemer, Aroyo Pedras Pintas.
Terebratula Wacoensis.—*Ibid.*
Inoceramus Crispii, Mant. Aroyo Pedras Pintas and Las Moras.
" " ? Salt Creek.
Neithea occidentalis, Con. Aroyo Las Minas, between Leon and Eagle Pass.
Ostrea carinata? Lam. Turkey Creek, Las Minas.
O. anomiæformis, Roemer, Turkey Creek, Las Minas.
Cardium congestum, Con. Valley of Royo San Felipe.
Ammonites flaccidicosta, Roemer, bed of Rio San Pedro.
A. Texanas, Roemer.
A. pedernalis, Roemer, Rio Bravo del Norte, near the mouth of Puercos river.
A pedernalis, Yellow stone.
Rostellites Texanus, Con. Eagle Pass.

POLYPI.

TURBINOLIA, Lam.

TURBINOLIA, TEXANA.

PLATE II, FIG. 3, *a*, *b*.

Horn-shaped, curved, with transverse, obtuse undulations; radii equal, prominent, numerous, (about 50 in number,) transverse section oval.

Locality.—Between El Paso and Frontera.

There are two specimens of this fossil in the collection, but the cup in each is filled with a portion of the limestone in which they were imbedded, and the characters are thus concealed.

ECHINODERMATA.

Several species of this family occur among the collections of the Boundary Survey. Three of these are identical with species described by Dr. F. Roemer, in his Kreidebildungen von Texas, while two others are quite distinct. Owing to the imperfection of the specimens in the collection, some of the figures have been copied from the work cited. It was not until the collections of the second survey of the Boundary were received that the *Toxaster elegans* was observed, and it has been figured on the supplementary plate 21. The association of these and other species with the well known cretaceous fossil *Gryphœa Pitcheri*, figured upon the same plate, leaves nothing further to be desired in proof of the age of the formation.*

PYRINA PARRYI, Hall.

PLATE I, FIG. 1, *a–d*.

Shell oblong ovoid, or somewhat pentagonal, with the angles rounded, convex above and concave in the middle beneath; apex central, flat or slightly depressed, prominently convex in front, and subtruncate behind; mouth central, oval; anus ovate, narrower above and situated centrally between the upper and lower side of the shell; ambulacral areas somewhat prominent or slightly elevated above the rest of the surface. Tubercles on the upper side scattered, with granular spaces between, becoming more numerous on the sides and crowded on the base of the shell. Length $1\frac{1}{4}$ inches; width $1\frac{1}{8}$ inches.

The general contour of the fossil is a broad oval, slightly narrower behind and subtruncate; while the elevation of the ambulacral space in front gives it a slight prominence in that part. This prominence of the ambulacral spaces likewise often gives an obtusely pentagonal form to the shell; but this character is not constant, nor is the slight prominence in front observable in all specimens.

This neat and pretty species is readily distinguishable from any other yet described from the cretaceous rocks of the southwest.

* Prof. Agassiz, to whom these fossils were submitted, expressed his opinion that they were from the lower cretaceous formation.

Fig. 1*a*. Upper side of specimen.
Fig. 1*b*. Lower side.
Fig. 1*c*. Posterior view.
Fig. 1*d*. Portion of the summit enlarged.
Locality.—Leon Springs, El Paso road.

TOXASTER TEXANUS.

PLATE I, FIG. 2, *a–c*.

Toxaster Texanus, Roemer, Kreidebildungen von Texas; p. 85, pl. x, fig. 3.

Shell oblong, subpentagonal-ovate, rotund before, the middle emarginate, truncate behind, elevated convex; mouth transverse, subreniform; anal aperture round-oval; the larger tubercles arranged in a triangular area upon the lower surface.

The specimens of this species in the collection are somewhat compressed vertically, cordate-ovate in form, rather abruptly emarginate in front.

Fig. 2*a*. View of the base of a specimen.
Fig. 2*b*. Upper side of the same.
Fig. 2*c*. Posterior view.
Locality.—Leon Springs, Texas.

CYPHOSOMA TEXANUM.

PLATE I, FIG. 3, *a–c*.

Diadema Texanum, F. Roemer, Texas; p. 392.
Cyphosoma Texanum, Roemer, Kreidebildungen von Texas; p. 82, pl. x, fig. 6.

Orbicular, scarcely subangular, little elevated, depressed above, plane or concave below; tubercles of the ambulacral and interambulacral areas equal, distinctly crenulate; tubercles of the ambulacral areas biserial, intermediate tubercles few; tubercles of the interambulacral areas arranged in two principal series, and two slightly smaller accessory series, intermediate tubercles numerous, scattered.

The specimens of this species in the Boundary collections are fragmentary.

Fig. 3*a*. Profile view.
Fig. 3*b*. View of lower side.
Fig. 3*c*. Enlargement of surface, showing the ambulacral and interambulacral tubercles, pores, etc.
Locality.—Leon Springs, Texas.

HOLECTYPUS PLANATUS.

PLATE I, FIG. 4, *a, b, c, d, e, f*.

Orbicular or subpentagonal, moderately elevated, extremely depressed conical; inferior surface plane, concave in the middle; ambulacral areas somewhat prominent above the rest of the surface; tubercles small above, larger below, vent ovate, very large, reaching from the mouth to the margin.

The specimens present some variety in the greater or less elevation of the apex; the base is often convex near the margin, becoming gradually depressed towards the centre. The tubercles are very minute above, giving a sense of roughness to the touch, becoming larger on the sides and much larger below. The upper surface is often nearly smooth, while the lower surface retains the tubercles strongly preserved.

Fig. 4*a*. Profile view.

Fig. 4*b*. Upper surface.

Fig. 4*c*. View of the base.

Fig. 4*e*. Ambulacral and interambulacral spaces enlarged.

Fig. 4*f*., *g*. Enlargement of a tubercle of base.

TOXASTER ELEGANS.

PLATE XXI, FIG. 1 *a–e*.

Hemiaster elegans, Shumard, in Marcy's report of Exploration of the Red River of Louisiana; page 210, pl. 2, fig 4 *a*, *b*, *c*.

Shell subcordate-ovate, much elevated, apex anteriorly sub-central, rotund before, and emarginate in the middle by a sinus which terminates below in the mouth; obtuse or subtruncate behind, with a shallow depression below the vent; mouth transverse, round-oval, with a shallow depression on each side extending to the margin, anus oval, near the upper margin; the larger tubercles scattered upon the upper surface, and becoming more numerous and larger on the sides and lower margin; a triangular lanceolate space beginning near the mouth, and widening to the posterior extremity, covered with large tubercles, with a space on each side entirely smooth, or with a few scattered tubercles.

This species has the ambulacral areas defined by broad, shallow grooves, which, with the exception of the anterior one, extend to the upper outer margin of the test. It resembles in many of its characters the specimens which have been identified as *Toxaster Texanum*, but the apex is more nearly central (being anterior to the centre, while in that one it is posterior.) In the specimens under consideration, the ambulacral spaces are all deeply impressed, and the antero-lateral ones are more divergent; the anus is nearer the upper edge, and its greatest length is in a vertical direction. Although the figures of Dr. Shumard convey no very definite idea of the characters, yet his description is very satisfactory, and leaves little doubt regarding the identity of that species with the one under examination.

Fig. 1*a*. Upper side.

Fig. 1*b*. Lower side.

Fig. 1*c*. Profile of posterior end.

Fig. 1*d*. Lateral view in outline.

Fig. 1*e*. Enlargment of the surface.

Locality.—Eagle Spring, Texas.

BIVALVES.

CAPRINA, D'Orbigny.

CAPRINA OCCIDENTALIS.

PLATE II, FIGURE 1, *a*, *b*, *c*.

Caprina occidentalis, Con. Proc. Acad. Nat. Sci. vol. VII, p. 268.

Falcate, flattened on the side of the outer curve, convex on the opposite, the other margins acutely rounded; surface very obscurely striated transversely, substance coarsely fibrous.

Locality.—Near the mouth of Puercos river.

CAPRINA PLANATA.

PLATE II, FIGURE 2, *a*, *b*.

Caprina planata, Con. Proc. Acad. Nat. Sci. Vol. VII, p. 268.

Flattened on one side and convex on the opposite, much compressed, very long and narrow, falcate, fibrous, and exhibiting small septa.

A fragment of a valve, two feet in length, and another smaller fragment, are all of this species that I have seen. The cavities between the septa are lined with crystals of carbonate of lime, and both this and the preceding species are imbedded in white friable limestone.

Locality.—Oak creek, near Puercos.

TEREBRATULA, Lhwyd. Lam.

TEREBRATULA WACOENSIS.

PLATE III, FIGURE 1.

Terebratula Wacoensis, Roemer, Kreide. von Texas, p. 81, pl. VI.

Inflated, semi-globose, pentagonal, smooth; front margin straight, not inflated, dorsal valve most convex; umbo obtuse, slightly incurved; area sufficiently distinct, circumscribed by an obtuse angle; ventral valve suborbicular, regularly convex; surface minutely punctate.

Locality.—

TEREBRATULA CHOCTAWENSIS.

Terebratula Choctawensis, Shumard, Geol. of Red river, p. 207, pl. II, fig. 3.

Suboval, truncated at base; both valves ventricose, surface elegantly marked with minute punctæ.

Locality.—Leon Springs.

TRIGONIA, Lam.

This interesting genus has been found as far down in the geological series as the triassic rocks. D'Orbigny enumerates ninety-nine species, and although there is one living representative on the coast of Australia yet the genus is unknown in the strata of tertiary periods.

TRIGONIA EMORYI.

PLATE III, FIGURE 2, *a*, *b*, *c*.

Trigonia Emoryi, Con. Proc. Acad. Nat. Sci., vol.

Inequilateral, obliquely truncated posteriorly, alated; obliquely ribbed; ribs about 34, narrow, prominent, compressed, or laterally abrupt, nodulose, diverging near the dorsal margin; ribs posteriorly, about the umbonal slope, composed of series of small nodules.

The form of this species approaches nearest to *T. crenulata*, but it is wider across the middle between the buccal and umbonal slope. The form of ribs is most nearly like those of *T. scabra*, but that shell has a wider anal area, and the dorsal depression is much smaller, being of a more ovate cuneate form.

Locality.—Between El Paso and Frontera.

TRIGONIA TEXANA.

PLATE III, FIGURE 3, *a*, *b*, *c*.

Trigonal cast of a large species, which is profoundly ventricose, truncated and direct on the ventral end, summits profoundly elevated; shell unknown.

Locality.—Leon Springs.

MACTRA, Lin. Lam.

MACTRA TEXANA.

PLATE IV, FIGURE 1, *a*, *b*.

Mactra Texana, Con. Proc. Acad. Nat. Sci., vol. VII, p. 269.

Triangular, ventricose, subequilateral, buccal end subangulated and slightly produced, much above the line of the base, which is regularly and profoundly curved, anal margin obliquely truncated, extremity angulated; buccal margin straight and very oblique; summit prominent.

This species is known from casts, and may prove to belong to the genus *Schizodesma*, Gray.

Locality.—Prairie between Laredo and Rio Grande city.

CUCULLÆA, Lam.

CUCULLÆA TERMINALIS.

PLATE IV, FIGURE 2, *a*, *b*.

Ovate-triangular, ventricose; buccal margin in the cast almost direct; anal side produced, cuneiform, extremity angulated; basal margin straight; summit profoundly prominent.

I have not seen the shell of this species. Comparing the casts with those of *C. vulgaris*, Morton, the summits are found to be much more prominent and more distant, as well as more nearly terminal.

Locality.—

ARCA, Lin.

ARCA SUBELONGATA.

PLATE VI, FIGURE 3, *a*, *b*.

Trapezoidal; anterior end regularly and rather acutely rounded; hinge and basal margins parallel; posterior extremity obliquely truncated.

Locality.—Between El Paso and Frontera.

ARCOPAGIA.

ARCOPAGIA TEXANA.

PLATE IV, FIGURE 3, *a*, *b*.

Arcopagia Texana, Roemer, Kreide. von Texas, pl. VI, fig. 8.

Orbicular, compressed, lentiform, inequivalve, subtortuous, cardinal margin nearly straight, forming an obtuse angle with the posterior margin; anterior muscular impression distinct, elongated, linguiform; posterior impression subrotund, approaching the cardinal margin; umbo small and slightly prominent.

CARDIUM, Lin. Lam.

CARDIUM MEDIALE.

PLATE IV, FIGURE 4, *a*, *b*.

Cordate, equilateral, ventricose; base profoundly and nearly regularly rounded; beaks prominent; posterior margin truncated, direct.

Locality.—

CARDIUM CONGESTUM.

PLATE VI, FIGURE 5, *a*, *b*, *c*, *d*.

Cordate, inflated, subequilateral; umbo prominent; beaks approximate; ribs radiating, probably about twenty-five in number.

An abundant species in the form of casts of entire specimens. A mere trace of the shell in one of these leads to the inference that the ribs were carinated. It has some general resemblance to *C. constantia*, D'Orbigny, but, unlike that species, it is oblique.

Locality.—Rio San Pedro.

CARDIUM, Sub-genus PROTOCARDIA, Beyrich.

The genus *Protocardia* of Beyrich was founded on the *Cardium Hillanum* of Sowerby. A number of species have been figured by authors—four have been described in D'Orbigny's Palæontologie Française. They are generally indicated by concentric lines or ribs, and have radiating striæ only on the post-umbonal area. The hinge resembles that of the Linnæan Cardium, and the species seem to pass into that genus, even through external characters. Nevertheless, they form a natural section, having no living representative, and characterizing the cretaceous and older tertiary formations.

CARDIUM (PROTOCARDIA) MULTISTRIATUM.

PLATE VI, FIGURE 4, *a*, *b*, *c*.

Cardium multistriatum, Shumard. Geol. of Red River, p. 207, pl. IV, fig. 2.

Subrotund, inflated, height and length nearly equal; truncated posteriorly; basal and anterior margins rounded; surface of posterior submargin, with 14–15 regular radiating striæ; remainder of surface marked with fine, equal, rounded, close concentric striæ; summit rather prominent.

Locality.—Leon Springs.

CARDIUM (PROTOCARDIA) TEXANUM.

PLATE VI, FIGURE 6, *a*, *b*, *c*.

Cardium Hillanum, Roemer, (not Sowerby,) Kreide. von Texas, p. 39, pl. VI, fig. 12.

Cordate, subquadrate, obliquely truncated posteriorly; umbo slightly oblique, submedial; disk concentrically ribbed; ribs large and prominent, rounded, laterally abrupt, fine and close on the umbo; post-umbonal area with about 17 tuberculated radiating lines.

Locality.—Between El Paso and Frontera.

CARDIUM (PROTOCARDIA) FILOSUM.

PLATE VI, FIGURE 7, *a*, *b*.

Triangular, elevated, with numerous minute, concentric lines anterior to the umbonal slope, which is obtusely carinated; umbonal and post-umbonal slopes marked with close, fine radii, about 30 in number.

This is the smallest species I have seen, and the only one with a carinated umbonal slope.

Locality.—Leon Springs.

CARDITA, Lam. Blainville.

CARDITA EMINULA.

PLATE VI, FIGURE 8.

Ovate-acute from beak to base, elevated; ribs 16, prominent, rounded? Those on the anterior slope angular, acute, umbo narrow, beaks pointed and elevated.

There is one specimen of this—a cast of both valves; there appear to be traces of radiating lines between the ribs.

Locality.—Leon Springs.

CORBULA.

CORBULA OCCIDENTALIS.

PLATE VI, FIGURE 9.

Allied to *C. oniscus*, Con.; but has finer and more numerous concentric furrows. It is probably an Eocene species; but was found in western Texas.

NEITHEA, Drouet.

This genus, it appears to me, should be restricted to that group of shells with an angular base of which *Pecten quinquecostatus*, Sowerby, is the type. So restricted, the genus is probably confined to the Cretaceous strata, and is certainly highly characteristic. No species of it occurs in Tertiary formations, nor in a living state.

NEITHEA OCCIDENTALIS.

PLATE V, FIGURE 1, *a*, *b*.

Neithea occidentalis. Conrad. Proc. Acad. Nat. Sci. vol. VII, p. 269.

Pecten quadricostatus, Roemer, (not Sowerby,) Kreide. von Texas, p. 64, pl. VIII, fig. 4.

Ovate-triangular; lower valve inflated, unequally ribbed, and concentrically striated, lines very fine; large ribs rounded and elevated, smaller ribs equal, two in number in each of the

intervals of the larger ribs, which latter have on each side a raised line or fine rib, giving it a trifid character; upper valve subconcave.

This species differs from *P. quadricostatus*, Sowerby, in having but two equal ribs between the larger, while that species his three corresponding ribs, and it is also proportionally a narrower or more elevated shell.

NEITHEA TEXANA.

PLATE V, FIGURE 2, *a*, *b*.

Pecten Texanus, Roemer, Kreide. von Texas, p. 65, pl. VIII, fig. 3.

Orbiculate-triangular, plano-convex; inferior valve convex, with 15–17 ribs, which are subequal, broad, flattened, smooth, and bisulcate laterally, or margined on each side by a small rib: superior valve flat; ribs unequal, slightly prominent, flattened.

Locality.—Between El Paso and Frontera.

LIMA.

LIMA WACOENSIS.

PLATE V, FIGURE 4, *a*, *b*.

Lima Wacoensis, Roemer, Kreide. von Texas, p. 63, pl. VIII, fig. 7.

Oblong-oblique, transverse, anteriorly subtruncated, with radiating ribs, which are slightly unequal, anteriorly narrower, closer, subdichotomous.

LIMA LEONENSIS.

PLATE V, FIGURE 3, *a*, *b*, *c*.

Very oblique, elevated, of a somewhat oblong-oval outline; buccal side produced, compressed, angular at the extremity; margin above the extremity truncated, very oblique; below it the margin is also truncated, and parallel with the umbonal slope; basal margin rounded; anal extremity angulated; ears small; ribs about 19 in number, angular or subangular, and carinated on the middle; surface with fine radiating lines, and towards the base the ribs are more distinctly carinated than above.

This is a larger species than the preceding, and differs in form, in having carinated ribs, and in having the summit of the right valve much more prominent or elevated than the left; the ears are also smaller, and the margin much below the summit of the right valve. The largest specimen measures rather more than 1½ inches from beak to anal extremity.

Locality.—Leon Springs.

INOCERAMUS, Sowerby.

INOCERAMUS CONFERTIM-ANNULATUS.

PLATE V, FIG. 5.

Inoceramus confertim-annulatus, Roemer, Kreide. von Texas, p. 59, pl. VII, fig. 4.

Transverse, oval, depressed, concentrically undulato-plicated and striated, folds robust, regularly rounded; intervals of the wider folds hardly equal; elevated lines very fine, equidistant, regular on the fold, and intervals.

Locality.—Near New Braunfels.

INOCERAMUS MYTILOPSIS.

PLATE V, FIG. 6, *a*, *b*.

Inoceramus mytiloides, Roemer, (not Mantell,) Kreide. von Texas, p. 60, Pl. VII, fig. 5.

Oblique, elongate-ovate, inflated, concentrically plicated and striated; umbo very oblique, summit acute, prominent; buccal side short, extremity obtusely rounded, and the margin above and below subtruncated, the latter parallel with the anal margin, which is oblique and subtruncated; anal side somewhat compressed.

This species is more oblique than *I. mytiloides*, with a longer cardinal line; is proportionally less elevated, with the margins subangulated, while in the *I. mytiloides*, they are regularly or obtusely rounded.

INOCERAMUS TEXANUS.

PLATE V, FIG. 7.

Elevated, suboval, compressed, equilateral; hinge, and lateral, and basal margins regularly rounded; folds robust, prominent, unequal; summit not prominent.

Locality.—Western Texas.

INOCERAMUS CRISPII.

PLATE V, FIG. 8.

Inoceramus Crispii, Mantell, Foss. of South Downs, p. 133, Pl. XXVII, fig. 11.

Equivalve, elongate-ovate, transverse, inflated, concentrically undulato-plicate, elegantly and finely striated; anal side subdepressed, produced; buccal side short, obliquely subtruncated; cardinal margin long and straight.

This appears to be the same species that Dr. Morton described as *I. Barabini*, but his specimens were very imperfect.

Localities.—San Antonio, Texas; Green county, Alabama.

PHOLADOMYA, Sowerby.

PHOLADOMYA TEXANA.

PLATE XIX, FIG. 3.

A fragment of a cast, with 13–14 distant, prominent, narrow, somewhat undulated or irregular ribs; intervening spaces concave; concentric lines coarse, but not very prominent.

Locality.—Turkey creek, Leon and Eagle Pass roads.

ASTARTE, Sowerby.

ASTARTE TEXANA.

PLATE V, FIG. 9.

Triangular, convex-depressed; buccal extremity subangulated, and much above the line of the base, which is regularly rounded. A cast representing both valves.

The locality is unknown to me; it is from western Texas.

CYTHEREA, Lam.

CYTHEREA LEONENSIS.

PLATE VI, FIG. 1.

Oblong-subovate, ventricose, very inequilateral; posterior margin, from beak to extremity, slightly sinuous; extremity truncated or obtusely rounded, direct.

Locality.—Leon Springs, El Paso road.

CYTHEREA TEXANA.

PLATE VI, FIG. 2.

Obliquely-ovate, ventricose, very inequilateral, with prominent lines of growth; umbo large; umbonal slope subangulated; buccal margin obtusely rounded; base profoundly rounded; dorsal margin straight, very oblique.

Locality.—Between El Paso and Frontera.

PLICATULA, Lam.

PLICATULA INCONGRUA.

PLATE VI, FIG. 10, *a*, *b*.

Ovate, small, lower valve ventricose, with prominent entire ribs bifurcating from the umbo; superior valve flattened, with squamose, scarcely prominent, ribs; interstices linear.

Fig. 10 *a* represents the flat squamose valve, and fig. 10 *b* the opposite smooth-ribbed valve, as they appear in relief on a piece of hard limestone.

EXOGYRA, Say.

This genus, which is related to *Gryphæa*, originated in the Oolitic epoch. It widely differs from *Ostrea*, though some authors, even at the present day, include the species in that genus. The fact that all the species died out before the oldest Tertiary period, favors the idea that the animal was somewhat differently organized from that of *Ostrea*.

EXOGYRA ARIETINA.

PLATE VII, FIG. 1, *a–c*.

Exogyra arietina, Roemer, Kreide. von Texas, p. 68, pl. VIII, fig. 10.

Exogyra arietina, var. *caprina*, Con. Jour. Acad. Nat. Sci., Vol. II, new series, p. 273.

Ventricose; larger valve having the umbo spiral, or shaped like a ram's horn; back with obtuse or obsolete angles and furrows, and undulated, subimbricated lines of growth; upper valve nearly flat, with concentric lamellose lines. Very abundant. The variety *caprina* is generally elegantly marked with distinct, prominent, radiating, interrupted, subnodulose ribs. On the weathered surface of the rock they project in great perfection, and are crowded in vast numbers. It is related to *E. Pellicoi*, Gervais.

Locality.—Leon Springs.

EXOGYRA FIMBRIATA.

PLATE VII, FIGURE 2, *a*, *b*.

Exogyra fimbriata, Conrad, Proc. Acad. Nat. Sci., vol. VII, p. 269.

Upper valve very thick, very convex, with 10 or 12 distant, concentric, prominent, imbricated laminæ; surface of valve covered with minute, semi-granular, interrupted, rugose lines; inner surface minutely subgranular interiorly; apex nearly terminal; lower valve unkown.

Locality—Western Texas.

EXOGYRA LÆVIUSCULA.

PLATE VII, FIGURE 4, *a*, *b*.

Exogyra læviuscula, Roemer, Kreid. von Texas, p. 70, pl. IX, fig. 3.

Ovate, gibbous; larger valve inflated, subhemispherical, obtusely carinated in the middle, smooth, irregularly ornamented towards the margin, with a few larger lines of increment; umbo distinctly spiral; interior margin of the valve suborbicular, thin.

Locality—Leon Springs.

EXOGYRA MATHERONIANA.

PLATE VIII, FIG. 1, *a*, *b*; and PLATE XI, FIG. 1, *a*, *b*.

Exogyra Matheroniana, D'Orbigny, Palæon. Fran., vol. III, p. 717, pl. 485, fig. 1.
Exogyra plicata, Goldfuss, (not Lam.)
Exogyra Texana, Roemer, Kreid. von Texas, p. 69, pl. X, fig. 1.
Exogyra Texana, Shumard, Palæon. of Red river, p. 205, pl. V, figs. 1 and 5.

Obliquely ovate, convex, thick; larger valve carinate-angulate; ribs radiating, unequal and granulate-nodose; umbo exhibiting a point of attachment; smaller valve granulose, with radiating ribs, often thickened; inner margin finely striated; muscular impression semi-circular or ovate, submedial.

Locality—Between El Paso and Frontera.

EXOGYRA COSTATA, var.

PLATE VIII, FIGURE 2.

Exogyra ponderosa, Roemer, Kreid. von Texas, p. 71, pl. IX, fig. 2.

Large, thick, ovate, inflated, concentrically lamellose-striate; larger valve gibbous, obtusely carinated, concentric, lamellæ, irregular, imbricated, laciniate towards the margin; umbo spiral, free; smaller valve thick, concentrically laminated, within smooth; umbo distinctly spiral, horizontal.

EXOGYRA COSTATA.

PLATE IX, FIG. 1 and 2; PLATE X, FIG. 1; and PLATE VIII, FIG. 3.

Exogyra costata, Say. Jour. Acad. Nat. Sci., vol. II, p. 43. Morton, Synopsis, p. 55, pl. VI, fig. 1 and 4.

Suboval, thick; lower valve convex, costated, concentrically corrugated; costæ somewhat

dichotomous, sometimes squamose; apex lateral, with about two volutions; muscular impression profound; upper valve with numerous elevated, concentric, squamose laminæ.

The Texan specimens agree in every respect with those of New Jersey and Alabama, and present the same varieties; some with, and others without, ribs, and every intermediate gradation.

Locality.—Jacun, three miles below Laredo.

EXOGYRA FRAGOSA.

PLATE VIII, FIGURE 2, *a*, *b*.

Exogyra fragosa, Con. Proc. Acad. Nat. Sci., vol. VII, p. 269.

Orbicular; lower valve ventricose posteriorly, flattened anteriorly; ribbed; ribs large and prominent, broad, irregular, some of them bifurcated, crossed by robust lamellar lines of growth; umbo small, flattened, very rough and strongly ribbed; inner margin rugosely striated; upper valve plano-convex, with a very uneven, subgranulated, rugose surface, and laminated towards the posterior and inferior margins; apex marginal.

A beautiful shell, differing from *E. ponderosa* or *costata* in having a much smaller umbo, wider ribs, and more rotund outline. The margins within are finely striated and anteriorly granulated. The upper valve is rugose-granulate interiorly. The figure does not well represent the elevation and inequality of the ribs.

Locality.—Between El Paso and Frontera.

GRYPHÆA, Lam.

GRYPHÆA PITCHERI.

PLATE VII, FIG. 3; and PLATE X, FIG. 2, *a*, *b*.

Gryphœa Pitcheri, Morton, Synopsis, p. 55, pl. XV, fig. 9.

Gryphœa dilatata, var. *Tucumcarii*, Marcou, Bul. de la Soc. Geol. de France, vol. XII, (May, 1855,) pl. XXI, fig. 3.

Ovate, gibbous, somewhat regular; inferior valve inflated, arcuate, lobed; lines of growth subimbricate; umbo large, prominent, subcompressed, incurved; smaller valve thick, with faint, impressed, radiating lines, compressed or laterally flattened above on the anterior side, slightly concave in the middle; surface concentrically imbricate-striate.

This widely-spread species occurs in all the localities in two distinct forms: one resembling *G. vesicularis*, and which is the type of the species as figured and described by Morton; and the other, truncated anteriorly, with a narrow, elongated, boat-shaped umbo, var. *navia*, pl. VII, fig. 3, *c*, *d*. The upper valve of the typical form is represented in pl. X, fig. 2, *a*, *b*. Roemer has given excellent figures of the var. *navia*.

Localities.—Leon Springs, Texas; plains of the Kiamesha, Arkansas; New Braunfels, Texas; Fort Washita and Cross Timbers, Texas.

OSTREA, Linn.

OSTREA SUBSPATULATA.

PLATE X, FIGURE 3, *a*, *b*.

Ostrea subspatulata, Lyell and Sowerby, Jour. Geol. Soc. London, vol. I, p. 61, (figured.)

Obovate; somewhat trapeziform, generally thick; higher than wide, narrower at the dorsal

than at the ventral or basal end, which is turned downwards at an obtuse angle; somewhat foliaceous externally; muscular impression placed very near the base.

This species approximates *O. Leymerii*, Desh. It was first discovered by Lyell in North Carolina, associated with *Belemnites mucronatus* and *Gryphæa vesicularis*. This group appears to represent the age of the *Gryphæa* and *Exogyra* beds of New Jersey.

Locality.—Western Texas.

OSTREA BELLA.

PLATE X, FIGURE 4, *a*, *b*.

Oblong-ovate, slightly curved; lower valve ventricose, undulated, with somewhat interrupted, radiating ribs, crossed by remote squamose concentric lines; beak produced; lesser valve flat, concave towards the base, marked by minute, obsolete, radiating lines.

Locality.—Western Texas.

OSTREA LUGUBRIS.

PLATE X, FIGURE 5.

Suboval; superior valve flat; inferior valve slightly ventricose, showing a mark of attachment on the umbo; ribs radiating, prominent, rugose, disappearing on the umbo. A small species, constant in character, and easily recognized.

Locality.—East of Red river, (Canadian,) New Mexico, Santa Fé road.

OSTREA CARINATA.

PLATE X, FIGURE 6.

Ostrea carinata, Lam. An. sans vert, Desh. ed. vol. VII, p. 240.
Ostrea carinata, Roemer, Kreid. von Texas, p. 75, pl. IX, fig. 5.

Subequivalve, elongated, arched, compressed, eared anteriorly, regularly plicated; folds equal, acute, carinated, diverging from a flattened surface on the back, geniculated at the angle and vertical on the sides, which are flattened.

I have not seen good specimens of this shell, and refer it to *carinata* chiefly on the authority of Roemer.

Localities.—Turkey creek, Las Minas; New Braunfels.

OSTREA VELLICATA.

PLATE XI, FIGURE 2, *a*, *b*.

Subovate, inferior valve convex, with very irregular, laminated, concentric lines, imbricated; surface as if pinched into cavities in places; beak subrostrated, thick; margins of the lower valve thickened, muscular impression comparatively near the base; hinge area broad.

I have seen but one valve of this species.

Locality.—Rio Grande, between El Paso and Frontera.

OSTREA ROBUSTA.

PLATE XI, FIGURE 3, *a*, *b*.

Elevated, subfalcate, thick; inferior valve convex; superior valve flattened, with rather distant subimbricated laminæ; apex truncated.

There are only two specimens of this species; the outer surface of the lower valve is abraded, and the characters obliterated; the upper valve in one is much thickened on the margins, which are crenulated within on the upper part.

Locality.—Jacun, three miles below Laredo.

OSTREA CORTEX.

PLATE XI, FIGURE 4, *a*, *d*.

Elongated, pointed towards the apex; inferior valve ventricose, very thick, with very prominent, concentric, imbricated laminae; cardinal fosset long and profound, somewhat curved, with a rounded ridge on each side.

A remarkable species, with a rough bark-like exterior; the upper valve is somewhat ventricose and marked like the opposite exteriorly.

Locality.—Dry creek, Mexico.

OSTREA MULTILIRATA.

PLATE XII, FIGURE 1, *a*, *d*.

Sub-triangular, thick and ponderous, somewhat curved; both valves flattened, irregularly undulated concentrically, and having numerous radiating, interrupted folds; umbo flat, very thick; cardinal fosset long and somewhat curved, deep, cavity very shallow.

This is a remarkable species, very variable in form. I know of no cretaceous species like this or the preceding, and as no other fossil was obtained with these, their geological age is uncertan; possibly they may belong to strata of earlier date than the cretaceous rocks of Texas.

Locality.—Dry creek, Mexico.

UNIVALVES.

NATICA, Lam.

NATICA TEXANA.

PLATE XIII, FIGURE 1, *a*, *b*.

Suboval; volutions, 5; rounded; spire prominent.

Locality.—Between Rio San Pedro and Rio Puercos.

NATICA COLLINA.

PLATE XIII, FIGURE 2, *a*, *b*.

This specimen may be the young of the former species. The cast is distorted and imperfect.

Locality.—Same as preceding.

ROSTELLARIA? Lam.

ROSTELLARIA? COLLINA.

PLATE XIII, FIGURE 3, *a*, *b*.

One or two imperfect casts of this fossil occur with the preceding *Natica*.

ROSTELLARIA? COLLINA.

PLATE XIII, FIGURE 4, *a*, *b*.

Elliptical; volutions, 6; those of the spire rounded; body volution, with a rather wide, slight, revolving depression near the suture.—(A cast.)

BUCCINOPSIS.

BUCCINOPSIS PARRYI.

PLATE XIII, FIGURE 4, *a*, *b*.

Sub-pyriform; longitudinally undulated and ornamented with rugose revolving lines; volutions flattened above; spire scalariform; aperture large and patulous.

Under this name I have described a cast which cannot be referred with accuracy to any known genus. The beak is broken and was probably produced.

Locality.—Same as preceding.

TURRITELLA, Lam.

TURRITELLA PLANILATERIS.

PLATE XIV, FIGURE 1, *a*, *b*.

Subulate; volutions with two large beaded revolving lines, and two smaller ones beneath, with an intermediate fine crenulated line; sides straight; the upper large revolving line gives the shell a carinated character.

Very distinct from *T. seriatum-granulatum*, Roemer. The shell and sculpture are in perfect preservation. It is accompanied by *Lima Leonensis*, a small *Natica*, and a small *Astarte*, which has about five broad concentric prominent ribs, and triangular in form. It may be named *Astarte crassilira*.

ROSTELLITES, Conrad.

ROSTELLITES TEXANA.

PLATE XIV, FIGURE 2, *a*, *b*.

Rostellites Texana, Con. Proc. Acad. Nat. Sci. Vol. VII, p. 268.

Narrow, elongated, with a subulate spire; plaits of columella oblique, straight, narrow, acute, largest above, and becoming obsolete towards the base; volutions of the spire flattened on the sides.

The above genus is probably related to Pterocera. The specimens are very imperfect, only one of them retaining any portion of the shell, and this is the columella with the plaits.

Locality.—Eagle Pass.

NERINEA, Defranc.

NERINEA SCHOTTII.

PLATE XIV, FIGURE 3, *a*, *b*.

Elongated; volutions concave or sub-angulated below the middle; destitute of lines except one slightly impressed line near and below the suture; body volution angulated in the middle.

A large and beautiful species, with the shell converted into carbonate of lime. Named in honor of its discoverer, Arthur Schott, esq.

NODOSARIA, Lam.

NODOSARIA TEXANA.

PLATE XIV, FIGURE 4, *a*, *b*, *c*.

Straight or slightly curved, subulate, nodes transversely oblong or depressed, ventricose, numerous.

Very abundant in the form of casts. The outline of the shell appears to have been nearly or quite straight below, and somewhat curved towards the apex.

Locality—Between El Paso and Frontera.

AMMONITES, Lam.

AMMONITES PLEURISEPTA.

PLATE XV, FIG. 1, *a*, *b*, *c*.

Discoid, much compressed, lentiform; back acute; volutions with obscure, distant, transverse ribs or undulations, and two series of nodules—one central and distinct, the other obsolete—elongated transversely and near the margin or back; transverse section of the whorls lanceolate; umbilicus very small; series of sutures of the septa crowded, gradually separating as they approach the inmost whorl; septal lobes short, suddenly expanded, crenulate, rounded; saddle bilobed, the lobes obtusely rounded, the third lobe from the dorsal the largest of the series.

This species approximates *A. pedernalis*, Roemer, who supposes it to be identical with the foreign species of that name described by Von Buch. It differs from Roemer's shell in having tubercles, in being less compressed, or forming a less acute angle with the back; in having a smaller umbilicus, and transverse undulations, and also in more crowded and very differently shaped septa. It attains a much larger size than the specimen figured.

Locality.—Jacun, 3 miles below Laredo.

AMMONITES GENICULATUS.

PLATE XV, FIG. 2, *a*, *b*.

Discoid, sides flattened and gradually sloping towards the back, which is abrupt, slightly rounded, and with a thick, prominent carina on the middle; ribs numerous, slightly curved until they approach the back, when they suddenly bend and become very oblique and more prominent, obsolete on the back; inner sides of the volutions abrupt.

Allied to *A. flaccidicosta*, Roemer, but may be distinguished by the dorsal carina and broader arms of the septal lobes, and flattened instead of rounded volutions; and also by the different form and inclination of the ribs.

Locality.—Bed of Rio San Pedro, and Leon Springs.

AMMONITES TEXANUS.

PLATE XVI, FIG. 1, *a*, *d*.

Ammonitse Texanus, Roemer; Kreid. von Texas, pl. VI, fig. 2, *a*, *b*.

Large, somewhat discoidal, involute; volutions subquadrangular, gradually increasing in

height and width, carinated and nodo-costate; dorsal carina continuous, the approximate series of tubercles not equal to it in prominence; ribs numerous, 22 on each volution, equidistant, ornamented with 5 tubercles; series near the dorsal carina compressed, elongated, the others rounded; transverse section of the exterior volution rectangular, of the interior volution quadrate; sutures of septa moderately divided and ramose.

Locality.—Near Puercos river.

AMMONITES LEONENSIS.

PLATE XVI, FIG. 2, *a*, *b*.

Volutions with thick, distant, rounded ribs, with a tubercle on each extremity and an intermediate rudimentary rib, having a tubercle on the dorsal angle; back obliquely truncated on each side of the carina.

This shell differs from *A. Texanus* in having the back elevated in the middle, and in being without tubercles on the back, in having only two series of nodes on the sides, or with a middle series of rudimentary or obsolete tubercles; also the serratures of the septal lobes are much wider than in *A. Texanus*.

TERTIARY FOSSILS.

OSTREA, Lin.

OSTREA VESPERTINA.

PLATE XVII, FIG. 1, *a–d*.

Ostrea vespertina, Con. Jour. Acad. Nat. Sci., vol. II, (new series) p. 300.

Ovate-subfalcate; lower valve plaited or ribbed; hinge long and wide, sharp and somewhat pointed; ligament cavity wide, profound, minutely wrinkled; margins abrupt; cavity not very deep; muscular impressions large, impressed; upper valve flat, irregular; pallial impression crenulated.

Resembles *O. subfalcata*, Con. of the Virginia Miocene.

Localities.—Carriso creek, and near San Diego, California. (Miocene.)

OSTREA VELENIANA.

PLATE XVII, FIG. 2, *a*, *b*.

Ovate, flattened, entire, with rugose lines of growth; cardinal area very broad: ligament pit shallow; muscular impression very large in proportion to the size of the shell, transverse; no crenulations visible about the margin.

This is probably a Miocene shell.

Locality.—Rancho Heleña, below Salado.

OSTREA CONTRACTA.

PLATE XVIII, *a*, *b*, *c*, *d*.

Ostrea contracta, Proc. Acad. Nat. Sci., vol. VII, p. 269.

Subfalcate, elongate, thick; exterior of lower valve very irregular, and varying from ventricose

to flat; cavity shallow and remarkably contracted towards the hinge, which is elongated, having a deep and broad cavity in the lower valve, with a corresponding rounded and striated ridge in the opposite valve.

This large oyster measures nearly two feet from beak to base. The contracted form of the cavity is most striking in the oldest individuals. Probably a Miocene shell.

Locality.—Oyster Point, Mexico.

ANOMIA, Lin.

ANOMIA SUBCOSTATA.

PLATE XIX, FIG. 1 *a*, *b*.

Anomia subcostata, Con. Proc. Acad. Nat. Sc.; vol. VII, p. 267.

Obtusely ovate, rather thick; umbo of larger valve ventricose; hinge thickened, surface of the valve obtusely undulated concentrically, and marked with waved, wrinkled, interrupted ribs, much raised, except towards the base, where they are larger and somewhat tuberculiform; upper valve entire, or with obsolete radii towards the base.

This has a general resemblance to *A. Ruffini*, Con., of the Virginia Miocene, but is much thicker and very distinct.

CARDITA, Lam. Blain.

CARDITA PLANICOSTA.

PLATE XIX, FIGURE 2, *a*, *b*.

Venericardia planicosta, Lam. An. sans Vert., vol. V, p. 669. Desh. Coq. Foss., vol. I, p. 149.
Cardita planicosta, Blainville.

Ovate-oblique, cordate, very thick, with flattened broad ribs, 22–24, granulated towards the apex; lunule very profound, wide, cordate, margin crenate within, cardinal teeth two, finely striated.

This species is found in Virginia and Alabama, as well as in California. Deshayes describes the Paris specimens of *C. planicosta* as crenulated on the ribs near the summit, a character scarcely visible in the specimens that I have examined.

Locality.—Arroyo las Minas, between Eagle Pass and Leon.

CORBULA, Lam.

CORBULA NASUTA.

PLATE XIX, FIGURE 4.

Corbula nasuta, Con. Foss. Shells of Tert. Form.
Corbula Alabamiensis, Lea, Cont. p. 45, pl. I, fig. 12.

Inflated, triangular-ovate, very inequivalve, ventricose; finely striated concentrically; buccal end rounded, longer than the anal, which is contracted; flexuous, narrow, and obliquely truncated at the end.

Locality.—Western Texas.

VENUS VESPERTINA.

PLATE XIX, FIGURE 5, *a*, *b*.

Subtriangular, inequilateral, convex; length and height equal; buccal end acutely rounded; anal end more obtuse; summit prominent.

A small Eocene species, with the external surface somewhat worn. It appears to have had concentric lines.

Locality.—Western Texas.

CYTHEREA, Lam.

CYTHEREA NUTTALI.

PLATE IV, FIGURE 5.

Cytherea Nuttali, Con. Foss. Shells of Tert. Form.

Subrotund, inflated, equilateral, ornamented with fine, regular, concentric lines, anal end obtusely rounded.

An Eocene species, found both in Texas and Alabama.

Locality.—East of Frontera, associated with *Cassidula alveata*.

VOLUTALITHES, Swainson.

VOLUTALITHES SAYANA.

PLATE XIX, FIGURE 6.

Voluta Sayana, Con. Foss. Shells of Tert. Form.
Voluta Defrancii, Lea, Cont., p. 171, pl. VI, fig. 179.
Voluta gracilis, Lea, Cont., p. 172, pl. VI, fig. 180.
Voluta parva, Lea, Cont., p. 173, pl. VI, fig. 181.

Turbinate, with revolving impressed lines; coronated; shell thin; volutions 7, subangulated; body volution either smooth or with longitudinal acute lines or folds.

There is only one small specimen of this abundant Claiborne species. It is imbedded in the same piece of rock which contains *Corbula nasuta* and *Natica limula*.

Locality.—Western Texas.

NATICA, Lam.

NATICA LIMULA.

PLATE XIX, FIGURE 7.

Natica limula, Con. Foss. Shells of Tert. Form.
Natica mamma, Lea, Cont. to Geol., p. 109, pl. IV, fig. 95.

Subglobose, flattened at base; spire rounded, pointed at the apex; columella much thickened above; umbilicus large; shell thin; mouth ovate.

Locality.—Same as preceding.

TURRITELLA, Lam.

TURRITELLA ————.

PLATE XIX, FIGURE 8.

This figure represents a specimen of tertiary rock from San Diego, California. Besides the *Turritella*, which is not determined, there are a few small unknown bivalves.

CASSIDULA, Humphreys. Sub-genus LACINIA, Con.

CASSIDULA ALVEATA.

PLATE XIX, FIGURE 9.

Melongena alveata, Con., Amer. Jour. Sci., vol. XXIII, p. 344.
Cassidula alveata, Con., Proc. Acad. Nat. Sci., vol. VII, p. 448.
Pyrula Smithii, Lea, Cont. to Geol., p. 153, pl. V, fig. 162.

Sub-globose, with revolving robust lines, and a wide, concave, revolving furrow below the angle of the large volution; spire very short; suture deeply impressed, sub-canaliculate.

Locality.—Western Texas.

APPENDIX.

CRETACEOUS FOSSILS.

CARDITA SUBTETRICA.

PLATE XXI, FIGURE 5.

Sub-orbicular, slightly ventricose; ribs 22? not very prominent, rounded, squamose, ribs and interstices about equal in width.

This may be an eocene species; I do not know any of its associated fossils.

Locality.—Rio Bravo del Norte.

PHOLADOMYA SANCTI-SABÆ.

PLATE XXI, FIGURE 4.

Cardium Sancti-Sabæ, Rœmer, Kreide. von Texas, p. 48, pl. VI, fig. 7.

Inequilateral, longitudinally ovate, gibbous, posteriorly compressed, produced, sub-caudate, smooth; the rest of the shell radiate-costate; ribs 16, equal, granulated, becoming obsolete posteriorly; umbo large, prominent, anterior to the middle.

Localities.—Leon Springs; New Braunfels, Texas.

CAPSA, Lam.

CAPSA TEXANA.

PLATE XXI, FIGURE 6.

Oblong-oval, disk flattened or depressed in the middle; radii distinct, close, rugose posteriorly, gradually becoming obsolete in the middle of the valve; buccal end regularly rounded; anal end truncated, direct.

Locality.—Leon Springs.

TEREBRATULA LEONENSIS.

PLATE XXI, FIGURE 2.

Inequivalved, oval or sub-petagonal; rostral end ventricose, rounded in the middle, and the sides obliquely convex-depressed; umbo small; foramen small, almost touching the umbo; imperforate valve less convex; valve widest above the middle, rapidly tapering to the front, which is slightly depressed; front margin narrow and truncated; surface elegantly and minutely punctate.

Narrower in front than *T. Wacoensis*, Rœmer. I cannot compare it with Shumard's figure of *T. Choctawensis*, as that figure, in the Palæontology of Red river, like all the representations of fossils in that work, (except *Gryphæa Pitcheri*,) is worthless for the purpose of identification. The punctuated surface is so common in the genus that it has no value in specific distinctions.

Locality.—Leon Springs.

TURRITELLA LEONENSIS.

PLATE XXI, FIGURE 7, *a*, *b*.

Volutions sub-angular, each with three distant, large, crenulated, revolving ribs, and an intermediate crenulated line; spire rapidly tapering to the apex; body volution large, rounded at base, which has four or five fine revolving ribs.

A limestone cast; traces of shell show oblique longitudinal folds or ribs.

HAMITES LARVATUS.

PLATE XXI, FIGURE 8.

Hamites larvatus, Con. Proc. Acad. Nat. Sci., vol. VII, p. 265.

Ovate-oval, obliquely ribbed; beak and front obtusely rounded or sub-truncated; ribs oblique, distant, very prominent, acute, unequal, frequently alternated, obsolete on the back, and having a tubercle on the front margin or angle; ribs on the front thickened and obtuse; sides of the shell flattened, and the rib margin nearly rectilinear; smaller ribs generally without a distinct tubercle.

I have amended the former description of this species from the specimen here figured. In the Arkansas specimen the ribs are alternated, the smaller one being without a tubercle; but the former has three equal ribs with the tubercle on each, and above them is the smaller rib without it. Traces of the shell show annular striæ.

Localities.—Leon Springs, Texas; White river, Arkansas.

EXPLANATION OF PLATES OF PROFESSOR HALL'S REPORT.

PLATE I.

FIG. 1.—PYRINA PARRYI.

Fig. 1 *a*. Upper side.
1 *b*. Lower side.
1 *c*. Posterior side.
1 *d*. Enlargement of the surface showing the larger and smaller granulations, ambulacral pores, etc.

FIG. 2.—TOXASTER TEXANUS.

Fig. 2 *a*. View of the base.
2 *b*. View of the summit.
2 *c*. Posterior view.

FIG. 3.—CYPHOSOMA TEXANUM.

Fig. 3 *a*. Profile view.
3 *b*. View of base.
3 *c*. Enlargement of ambulacral and interambulacral spaces, (figures from Roemer.)

FIG. 4.—HOLECTYPUS PLANATUS.

Fig. 4 *a*. Profile view.
4 *b*. Summit.
4 *c*. Base.
4 *d*. Enlargement of the summit of the test.
4 *e*. Enlargement of the ambulacral and interambulacral spaces.
4 *f*, *g*. Base of attachment of spine enlarged.

PLATE II.

FIG. 1.—CAPRINA OCCIDENTALIS.

Fig. 1 *a*, *b*. Upper and lower sides.
1 *c*. Transverse section.

FIG. 2.—CAPRINA PLANATA.

Fig. 2 *a*. A fragment one third the linear dimensions.
2 *b*. Enlargement showing structure.

FIG. 3.—TURBINOLIA TEXANA

Fig. 3 *a*. Specimen natural size.
3 *b*. Enlargement of the lamellae.

PLATE III.

FIG. 1.—TEREBRATULA WACOENSIS.

Fig. 1 *a*. Dorsal view.
1 *b*. Ventral view.
1 *c*. Profile view.
1 *d*. Enlargement of surface.

FIG. 2.—TRIGONIA EMORYI.

Fig. 2 *a*. Posterior view.
2 *b*. Anterior view.
2 *c*. Right valve.

FIG. 3.—TRIGONIA TEXANA.

Fig. 3 *a*. Lateral view.
3 *b*. Posterior view.
3 *c*. Anterior view.

PLATE IV.

FIG. 1.—MACTRA TEXANA.

Fig. 1 *a*. Lateral view.
1 *b*. Cardinal view.

FIG. 2.—CUCULLEA TERMINALIS.

Fig. 2 *a*. Lateral view.
2 *b*. Anterior cardinal view.

FIG. 3.—ARCOPAGIA TEXANA.

Fig. 3 *a*. Lateral view.
3 *b*. Cardinal view.

FIG. 4.—CYTHEREA NUTTALLI.

Fig. 4 *a*. Lateral view.
4 *b*. Cardinal view.

PLATE V.

FIG. 1.—NEITHEA OCCIDENTALIS.

Fig. 1 *a*. Lower valve.
1 *b*. Profile view.
1 *c*. Enlargement of the surface.

FIG. 2.—NEITHEA TEXANA.

Fig. 2 *a*. Lower valve.
2 *b*. Enlargement of surface.

FIG. 3.—LIMA LEONENSIS.

Fig. 3 *a*. Right valve.
3 *b*. Postero-cardinal view.
3 *c*. Enlargement of surface.

FIG. 4.—LIMA WACOENSIS.

Fig. 4 *a*, *b*. Lateral and cardinal views.

FIG. 5.—INOCERAMUS CONFERTIM ANNULATUS.

FIG. 6.—INOCERAMUS MYTILOPSIS.

Fig. 6 *a*. Figure, (after Roemer.)
6 *b*. Fragment of New Mexican specimen.

FIG. 7.—INOCERAMUS TEXANUS.

FIG. 8.—INOCERAMUS CRISPII.

FIG. 9.—ASTARTE TEXANA.

PLATE VI.

FIG. 1.—CYTHEREA LEONENSIS.

FIG. 2.—CYTHEREA TEXANA.

FIG.—3.—ARCA SUB-ELONGATA.

Fig. 3 *a*. Left valve.
3 *b*. Cardinal view.

FIG. 4.—CARDIUM MULTISTRIATUM.

Fig. 4 *a*. Right valve.
4 *b*. A larger individual.
4 *c*. Profile view.

FIG. 5.—CARDIUM CONGESTUM.

Fig. 5 *a*. Right valve.
5 *b*. Posterior view.
5 *c*. A larger individual.
5 *d*. Profile of same.

FIG. 6.—CARDIUM TEXANUM.

Fig. 6 *a*. Right valve.
6 *b*. Posterior view.
6 *c*. Anterior view.

FIG. 7.—CARDIUM FILOSUM.

Fig. 7 *a*. Left valve.
7 *b*. Enlargement of surface.

FIG. 8.—CARDITA EMINULA.

Fig. 8. Lateral and profile views.

FIG. 9.—CORBULA OCCIDENTALIS.

FIG. 10.—PLICATULA INCONGRUA.

Fig. 10 *a*. Lower valve.
10 *b*. Upper valve and interior of lower valve.

PLATE VII.

FIG. 1.—EXOGYRA ARIETENUM.

Fig. 1 *a*. Upper valve, exterior view.
1 *b*. Upper valve, interior.
1 *c*. Lower valve.
1 *d*, *e*. Two views, same specimen.

FIG. 2.—EXOGYRA FOLIACEA.

Fig. 2 *a*. Upper valve, exterior surface.
2 *b*. Upper valve, interior surface.

FIG. 3.—GRYPHÆA PITCHERI.

Fig. 3 *a*. Lower valve, exterior surface.
3 *b*. View of upper side of shell, with valves attached.
3 *c*. Profile of large valve.
3 *d*. Large valve, variety *navia*.
3 *f*. Upper valve, exterior view.
3 *g*. Upper valve, interior view.

FIG. 4.—GRYPHÆA LÆVIUSCULA.

Fig. 4 *a*. Lower valve.
4 *b*. Profile of same.

PLATE VIII.

FIG. 1.—EXOGYRA MATHERONIANA.

Fig. 1 *a*. Lower valve.
1 *b*. Anterior view.

FIG. 2.—EXOGYRA FRAGOSA.

Fig. 2 *a*. Lower valve, exterior view.
2 *b*. Lower valve, interior view.

FIG. 3.—EXOGYRA TEXANA—variety.

PLATE IX.

FIG. 1.—EXOGYRA COSTATA—variety.

Fig. 1. Exterior view of specimen fig. 3 of the preceding plate.

FIG. 2.—EXOGYRA COSTATA.

Fig. 2 *a*. Exterior view of lower valve.
2 *b*. Interior of lower valve.

PLATE X.

FIG. 1.—EXOGYRA COSTATA.

Fig. 1. Exterior view of the lower valve, showing the obsolescent character of the costæ.

FIG. 2.—GRYPHÆA PITCHERI.

Fig. 2 *a*. Exterior of upper valve.
2 *b*. Interior of the same.

FIG. 3.—OSTREA SUBSPATULATA.

Fig. 3 *a*. Exterior view of the upper valve.
3 *b*. Interior of the same.

FIG. 4.—OSTREA BELLA.

Fig. 4 *a*. View of the upper side of the two valves attached.
4 *b*. Lower valve, exterior view.

FIG. 5.—OSTREA LUGUBRIS.

Fig. 5 *a*, *b*. Exterior and interior of lower valve.

FIG. 6.—OSTREA CARINATA.

PLATE XI.

FIG. 1.—EXOGYRA MATHERONIANA.

Fig. 1 *a*, *b*. Exterior and interior views of lower valve.

FIG. 2.—OSTREA VELLICATA.

Fig. 2 *a*, *b*. Exterior and interior views of lower valve.

FIG. 3.—OSTREA ROBUSTA.

Fig. 3 *a*. Upper side, with the shell exfoliated.
3 *b*. Lower side, retaining the shell, in part.

FIG. 4.—OSTREA CORTEX.

Fig. 4 *a*, *b*. Exterior and interior of a lower valve.
4 *c*, *d*. Exterior and interior of an upper valve.

PLATE XII.

FIG. 1.—OSTREA MULTILIRATA.

Fig. 1 *a*, *b*. Exterior and interior of upper valve.
1 *c*, *d*. Exterior and interior of lower valve, showing a different form.

PLATE XIII.

FIG. 1.—NATICA TEXANA.

Fig. 1 *a*, *b*. Two views of same specimen.

FIG. 2.—NATICA COLLINA.

Fig. 2 *a*, *b*. Two views of the same specimen.

FIG. 3.—ROSTELLARIA? COLLINA.

Fig. 3 *a*, *b*. Two views of the same specimen.

FIG. 4.—ROSTELLARIA? TEXANA.

Fig. 4 *a*, *b*. Two views of the same specimen.

FIG. 5.—BUCCINOPSIS PARRYI.

Fig. 5 *a*, *b*. Two views of the same specimen.

PLATE XIV.

FIG. 1.—TURRITELLA PLANILATERIS.

Fig. 1 *a*. A fragment of the shell, natural size.
1 *b*. A part of the surface, enlarged.

FIG. 2.—ROSTELLITES TEXANA.

Fig. 2 *a*, *b*. Two views of same specimen.

FIG. 3.—NERINEA SCHOTTII.

Fig. 3 *a*, *b*. Two views of same specimen.

FIG. 4.—NODOSARIA TEXANA.

Fig. 4 *a*. Exterior view of specimen, enlarged.
4 *b*. Longitudinal section.
4 *c*. A transverse section.

PLATE XV.

FIG. 1.—AMMONITES PEDERNALIS, (Var.)

Fig. 1 *a*. Lateral view.
1 *b*. Front view.
1 *c*. Plan of septa, enlarged.

FIG. 2.—AMMONITES GENICULATUS.

Fig. 2 *a*. Lateral view.
2 *b*. Front view.

PLATE XVI.

FIG. 1.—AMMONITES TEXANUS.

Fig. 1 *a*. Lateral view.
1 *b*. View of aperture.
1 *c*. Plan of septa, enlarged.
1 *d*. Young variety, (after Rœmer.)

FIG. 2.—AMMONITES LEONENSIS.

Fig. 2 *a*. Lateral view.
2 *b*. Aperture, &c.

PLATE XVII.

FIG. 1.—OSTREO VESPERTINA.

Fig. 1 *a*, *b*. Exterior and interior of upper valve.
1 *c*, *d*. Exterior and interior of lower valve.

FIG. 2.—OSTREO VELENIANA.

Fig. 2 *a*, *b*. Exterior and interior of upper valve.

PLATE XVIII.

FIG. 1.—OSTREA CONTRACTA.

Fig. 1 *a*. Exterior view of a narrow valve.
1 *b*. Exterior view of a shell of the usual form.
1 *c*. Interior and lateral view of larger valve. (Figures one-third, in linear measurement, of the originals.)
1 *d*. Enlargement of surface of the ligamental pit.

PLATE XIX.

FIG. 1.—ANOMIA SUBCOSTATA.

Fig. 1 *a*, *b*. Exterior and interior of lower valve.

FIG. 2.—CARDITA PLANICOSTA.

Fig. 2 *a*. Left valve, natural size.
2 *b*. Enlargement of surface, showing concentric striæ.

FIG. 3.—PHOLADOMYA TEXANA.

FIG. 4.—CORBULA NASUTA.

FIG. 5.—VENUS VESPERTINA.

Fig. 5 *a*. Right valve, natural size.
5 *b*. Enlargement of surface.

FIG. 6.—VOLUTALITHES SAYANA.

FIG. 7.—NATICA EMINULA.

FIG. 8.—TURRITELLA ——?

FIG. 9.—CASSIDULA (LACINIA) ALVEATA.

Fig. 9 *a*. View of the aperture.
9 *b*. Back of the shell.

PLATE XX.

FIG. 1.—COLUMNARIA THOMI.

Fig. 1 *a*. A fragment of stone with the coral, (ends of columns,) natural size.
1 *b*. Lateral view of same.
1 *c*. Longitudinal section enlarged.
1 *d*. Transverse section enlarged.

FIG. 2.—TEREBRATULA MEXICANA.

Fig. 2 *a*, *b*, *c*. Dorsal, ventral and profile views.

FIG. 3.—[illegible]

Fig. 3 a. Shell, natural size.
3 b. Enlargement of striæ.

FIG. 4.—[illegible]

FIG. 5.—ASAPHUS [illegible]

PLATE XXI.

FIG. 1.—[illegible]

Fig. 1 a. View of summit of specimen.
1 b. Base of same.
1 c. Posterior, profile view.
1 d. Lateral view, profile in outline.
1 e. Enlargement of surface.

FIG. 2.—[illegible]

Fig. 2 a, b. Dorsal and profile views.
2 c. Enlargement, showing punctate character of shell.

FIG. 3.—[illegible]

Fig. 3 a. View of upper side of specimen with the two valves attached.
3 b. Exterior of the lower valve of same.
3 c. Interior of lower valve of a smaller individual.

FIG. 4.—[illegible]

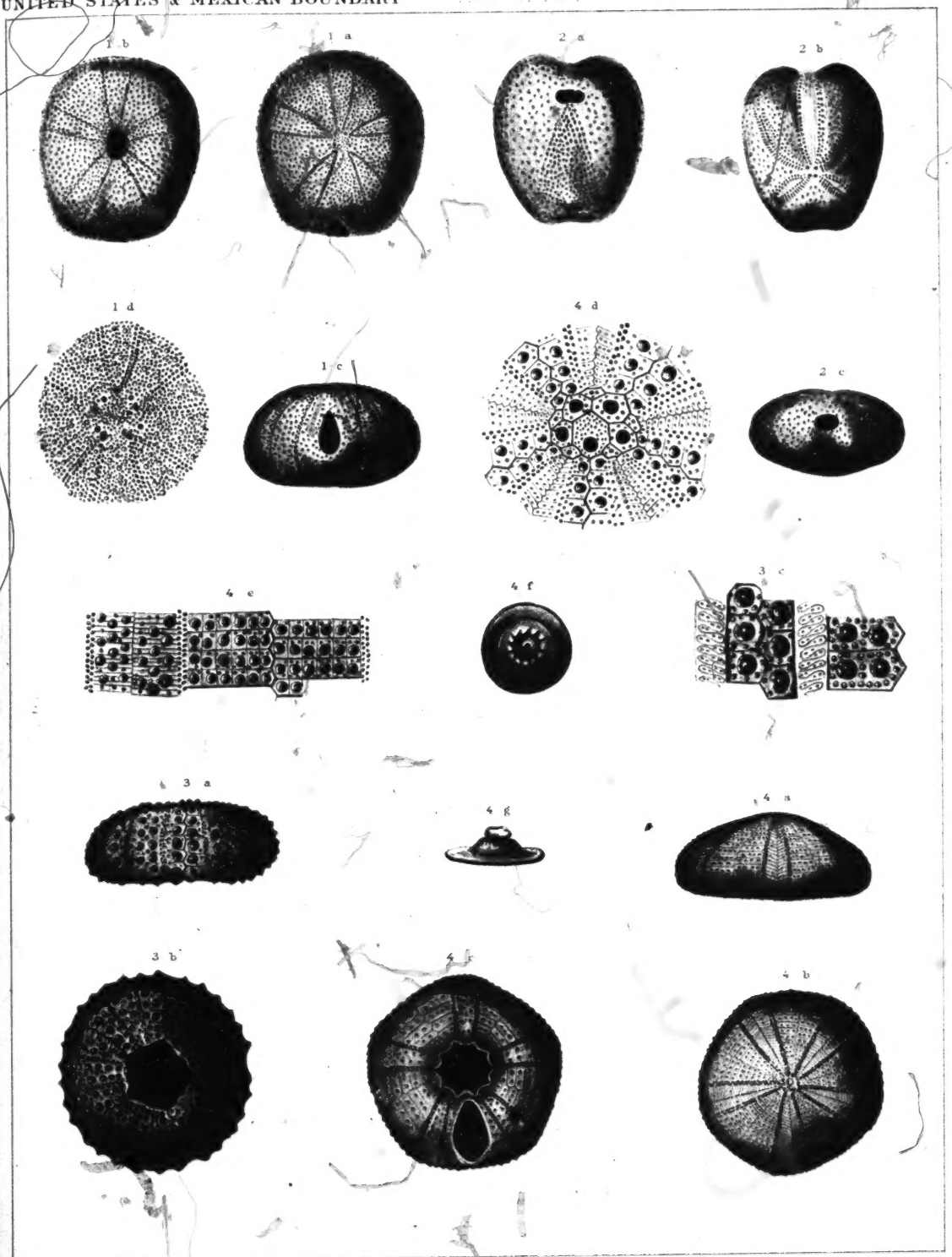
FIG. 5.—CARDITA SUBTRIGONA.

FIG. 6.—CAPRA TEXANA.

FIG. 7.—[illegible]

Fig. [illegible] b. Two views of the same individual.

FIG. 8.—HAMITES LARVATUS.



F.B. Meek del. J.E. Gavit sc.

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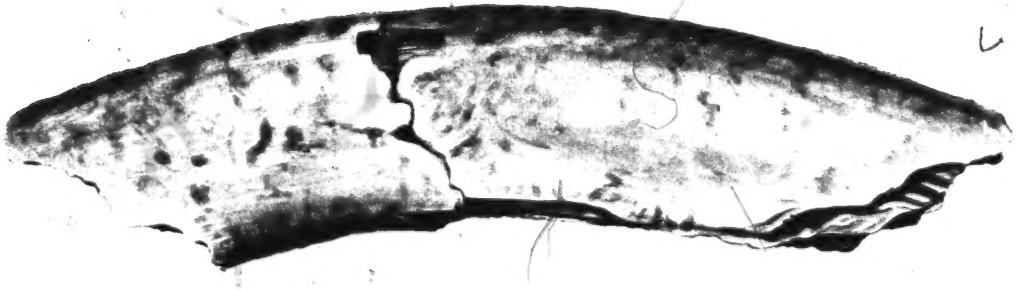

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W H Dougal Sc

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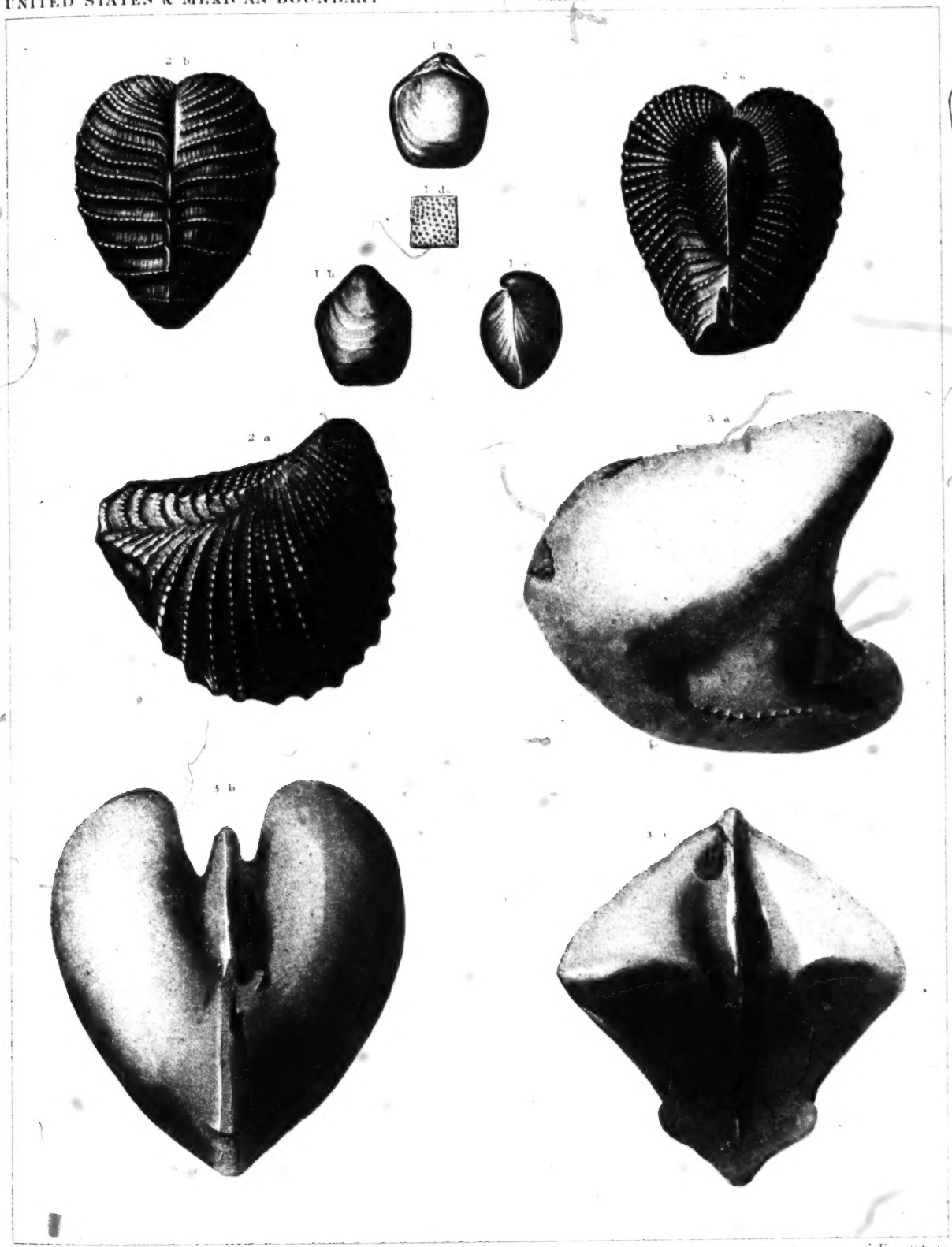
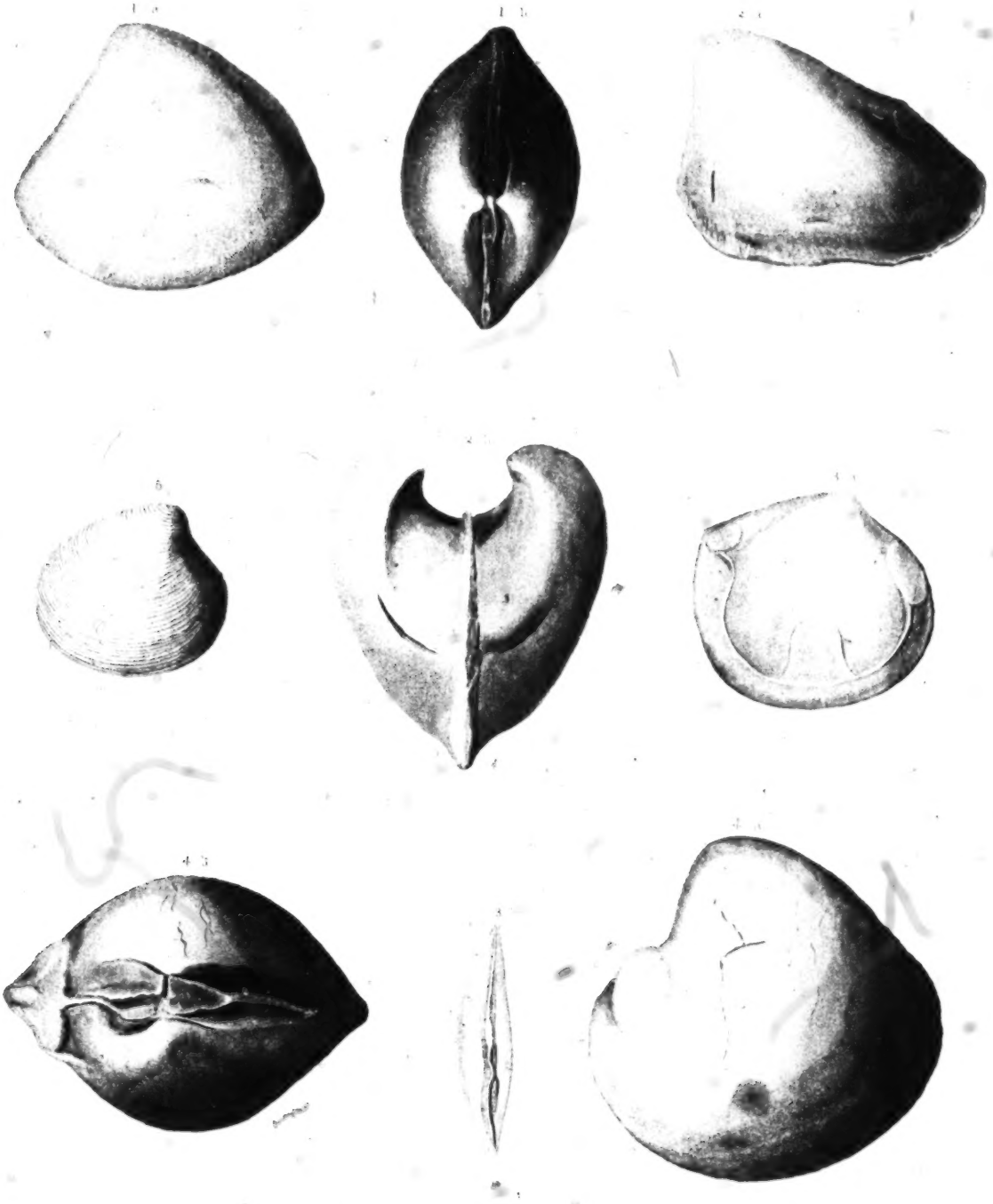


F B Meek del

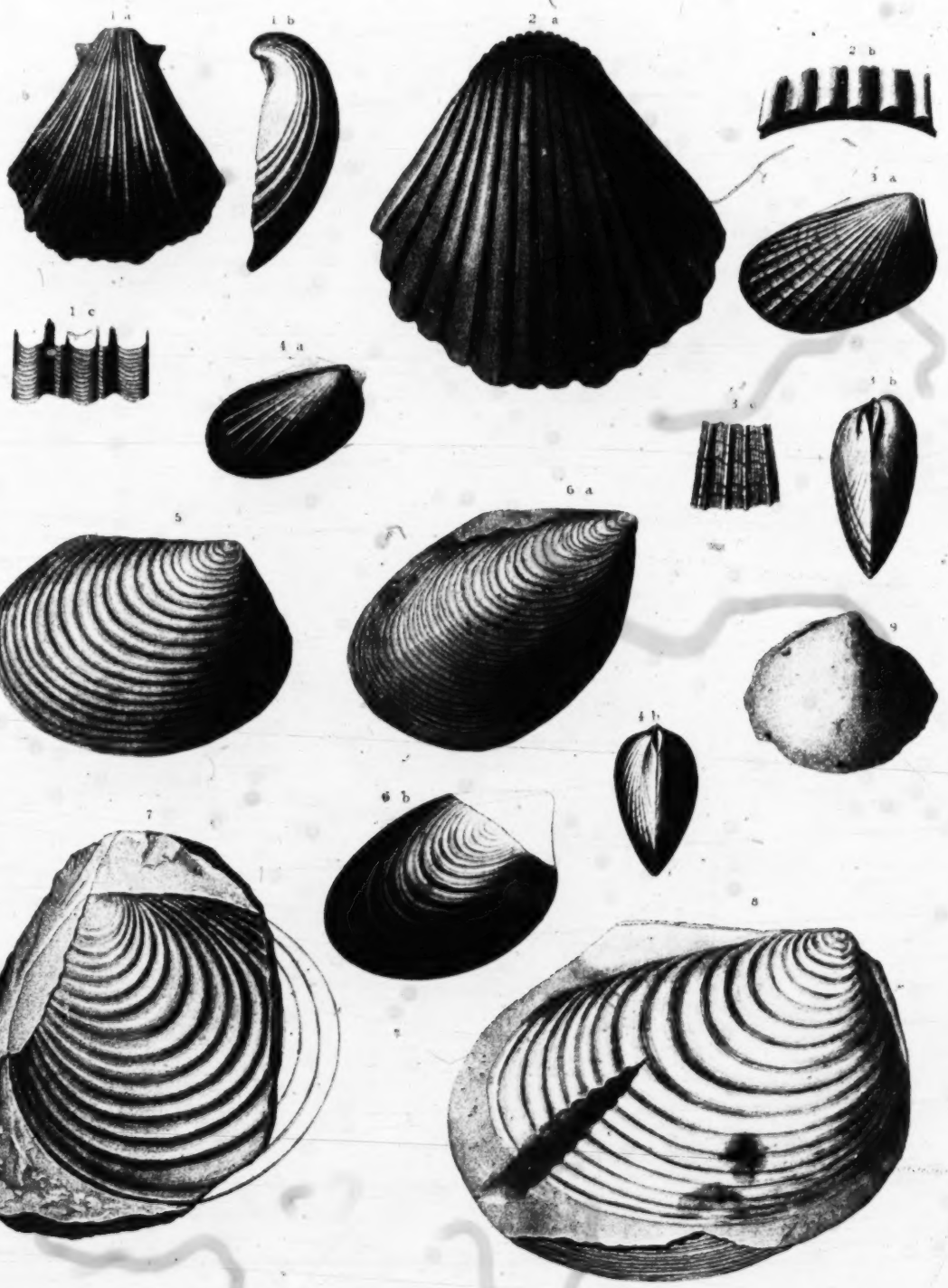
J E Lewis s.

1 TEREBRATULA WACOENSIS. 2 TRIGONIA EMORYI. 3 TRIGONIA TEXANA.



F B Meek del

1 MACTRA TEXANA. 2 CUCULLEA TERMINALIS. 3 ARCOPAGIA TEXANA. 4 CARDIUM MEDIALE. 5 CYTHEREA NUTTALLII



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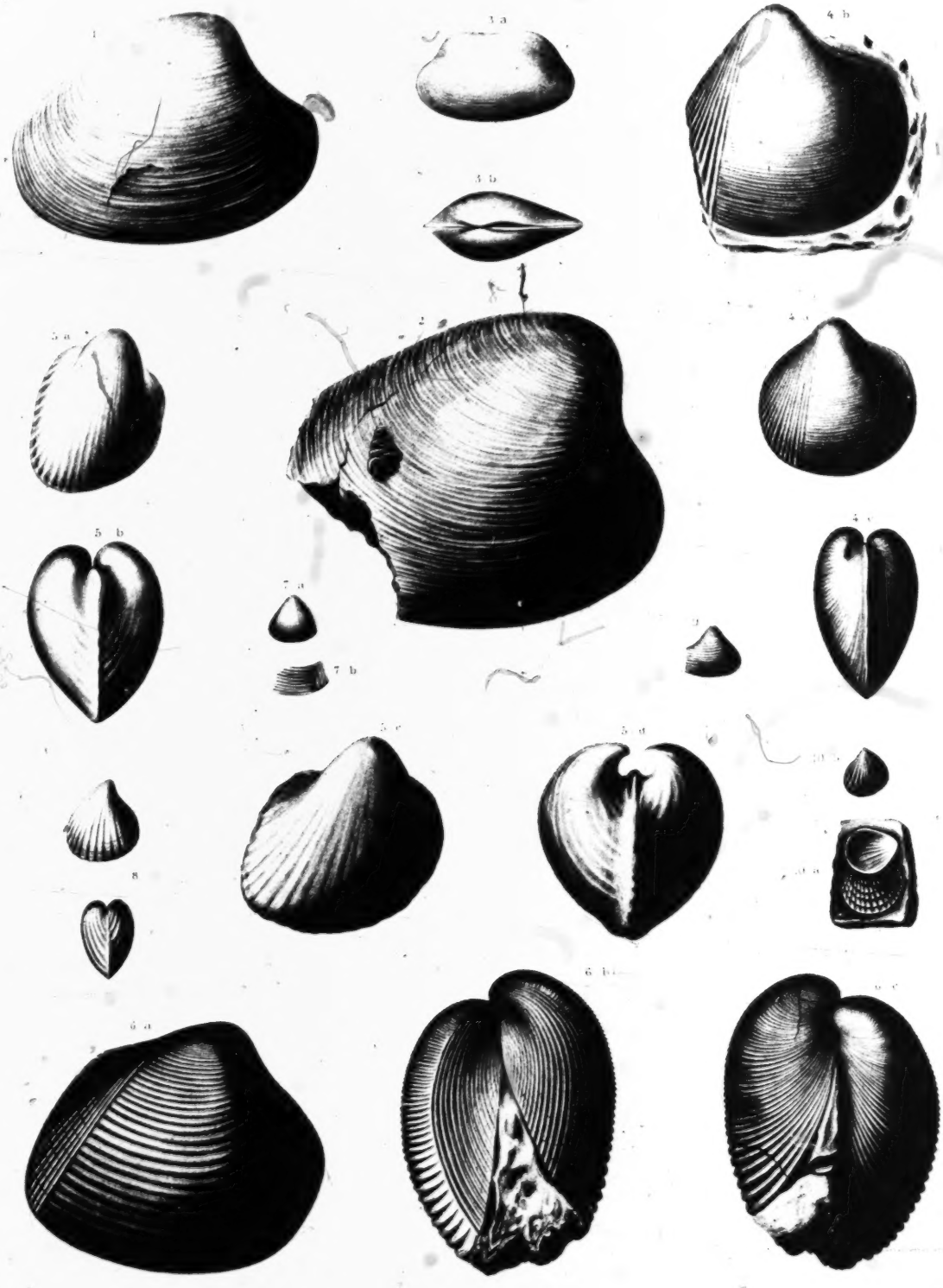
J.E.Gavit Sc.

1 NEITHA OCCIDENTALIS. 2 NEITHA TEXANA. 3 LIMA LEONENSIS. 4 LIMA WACOENSIS. 5 INOCERAMUS CONFERTIM-ANNULATUS.
6 INOCERAMUS MYTILOPSIS. 7 INOCERAMUS TEXANUS. 8 INOCERAMUS CRISPII. 9 ASTARTE TEXANA.



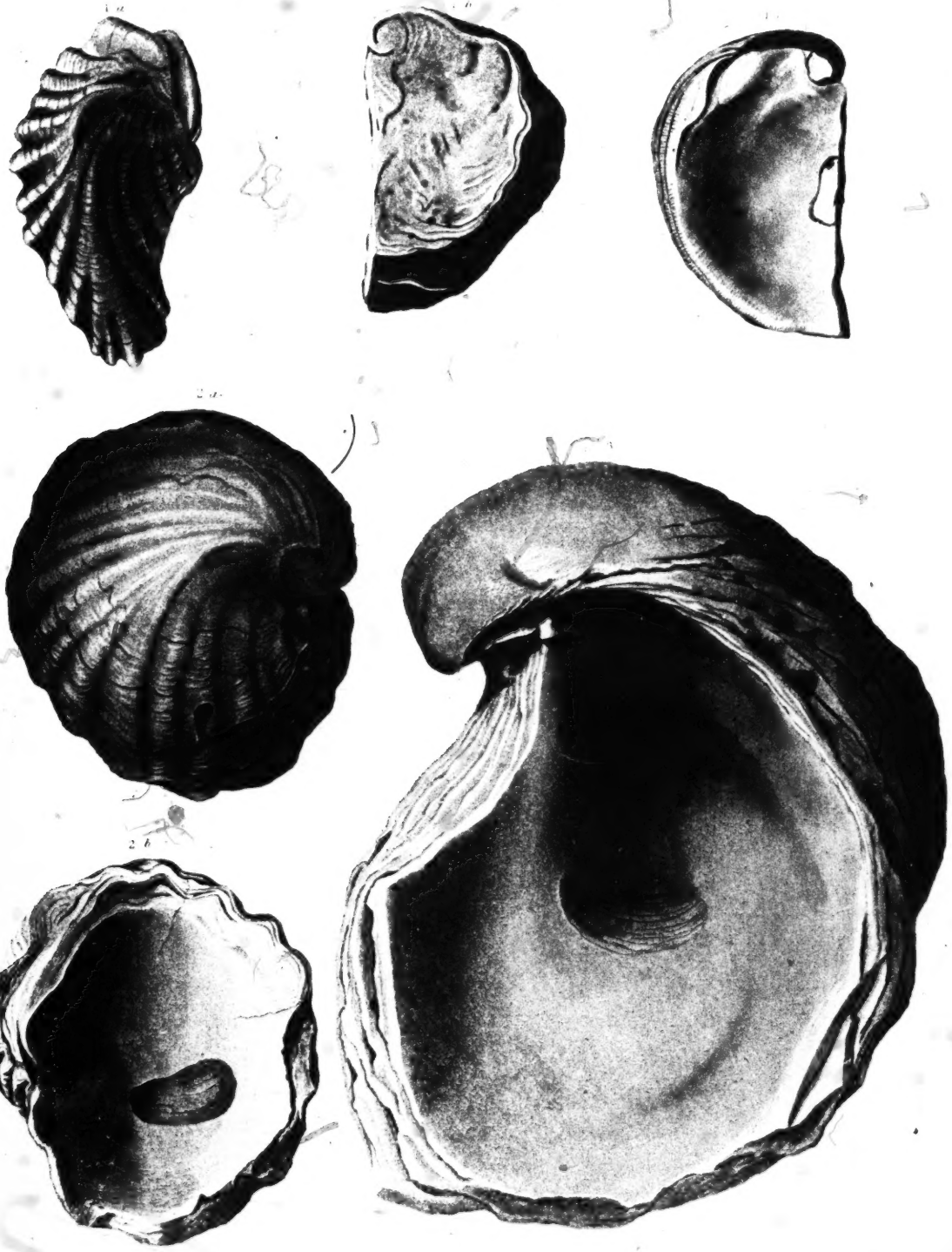
F B Meek Del

1 CYTHEREA LEONENSIS. 2 C. TEXANA. 3 ARCA SUBELONGATA. 4 CARDIUM MULTISTRIATUM. 5 C. CONGESTUM. 6 C. TEXANUM. 7 C. FILOSUM
8 CARDITA EMINULA. 9 CORBULA OCCIDENTALIS. 10 PLICATULA INCONGRUA.

F B Meek del

J E Gavit

1. EXOGYRA ARIETENUM. 2 EXOGYRA FOLIACEA 3 GRYPHÆA PITCHERI. 4 GRYPHÆA LÆVIUSCULA.



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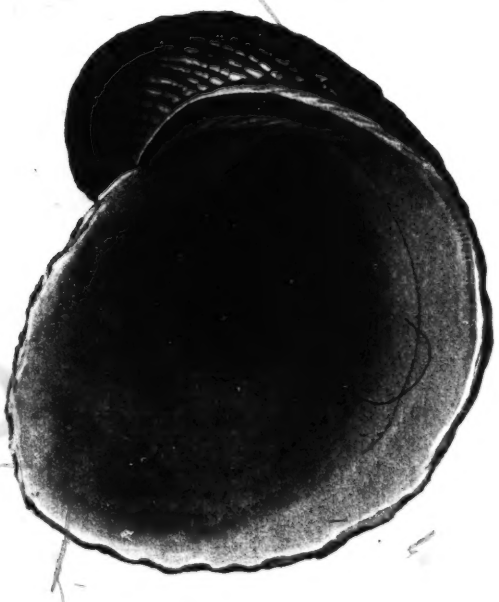

F B Meek del

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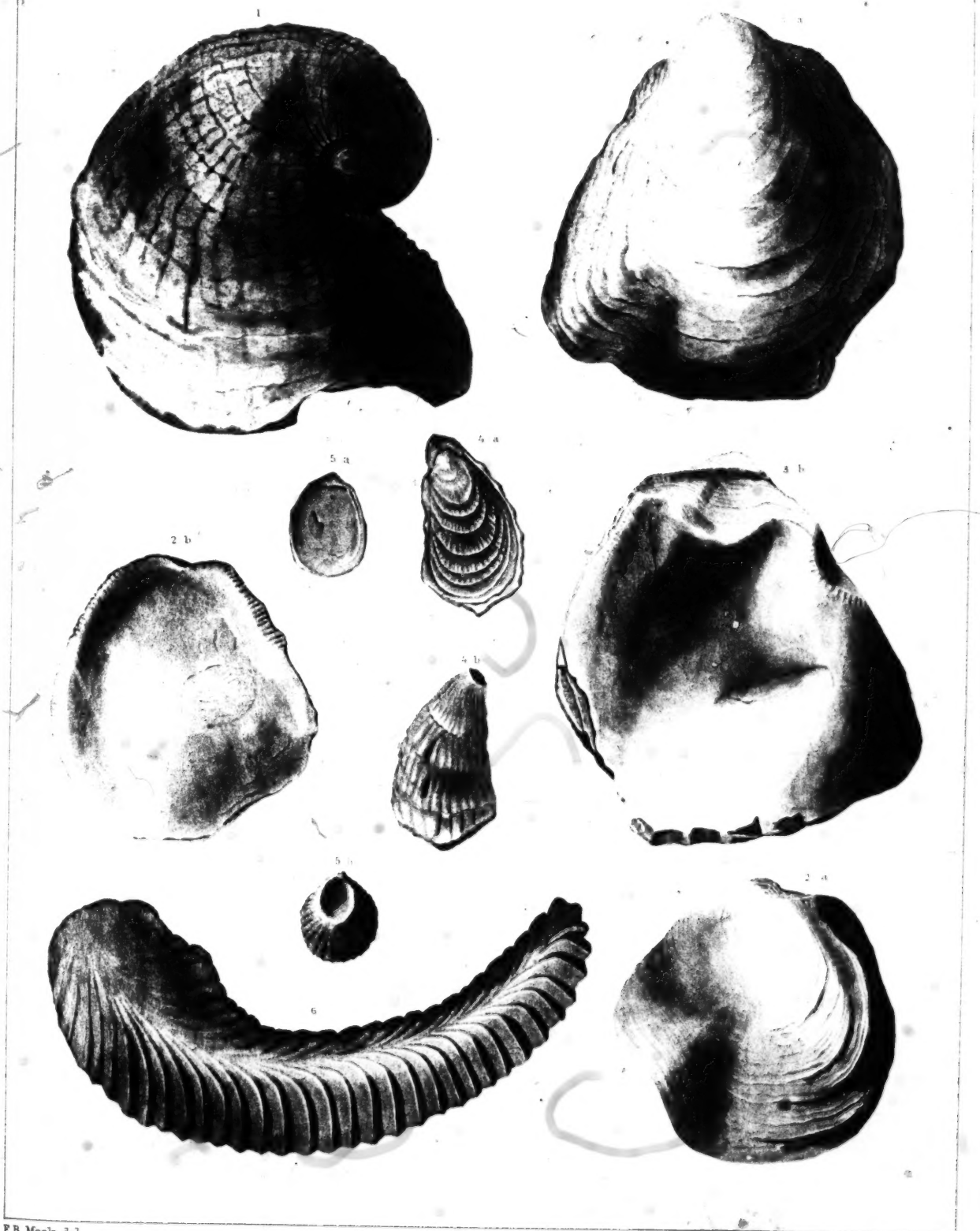

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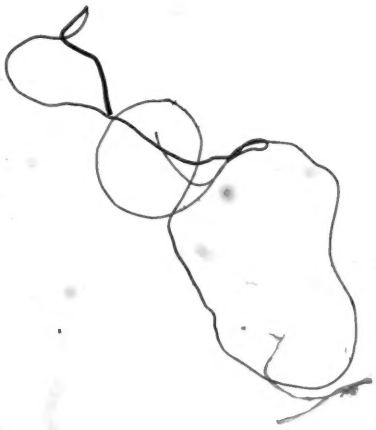
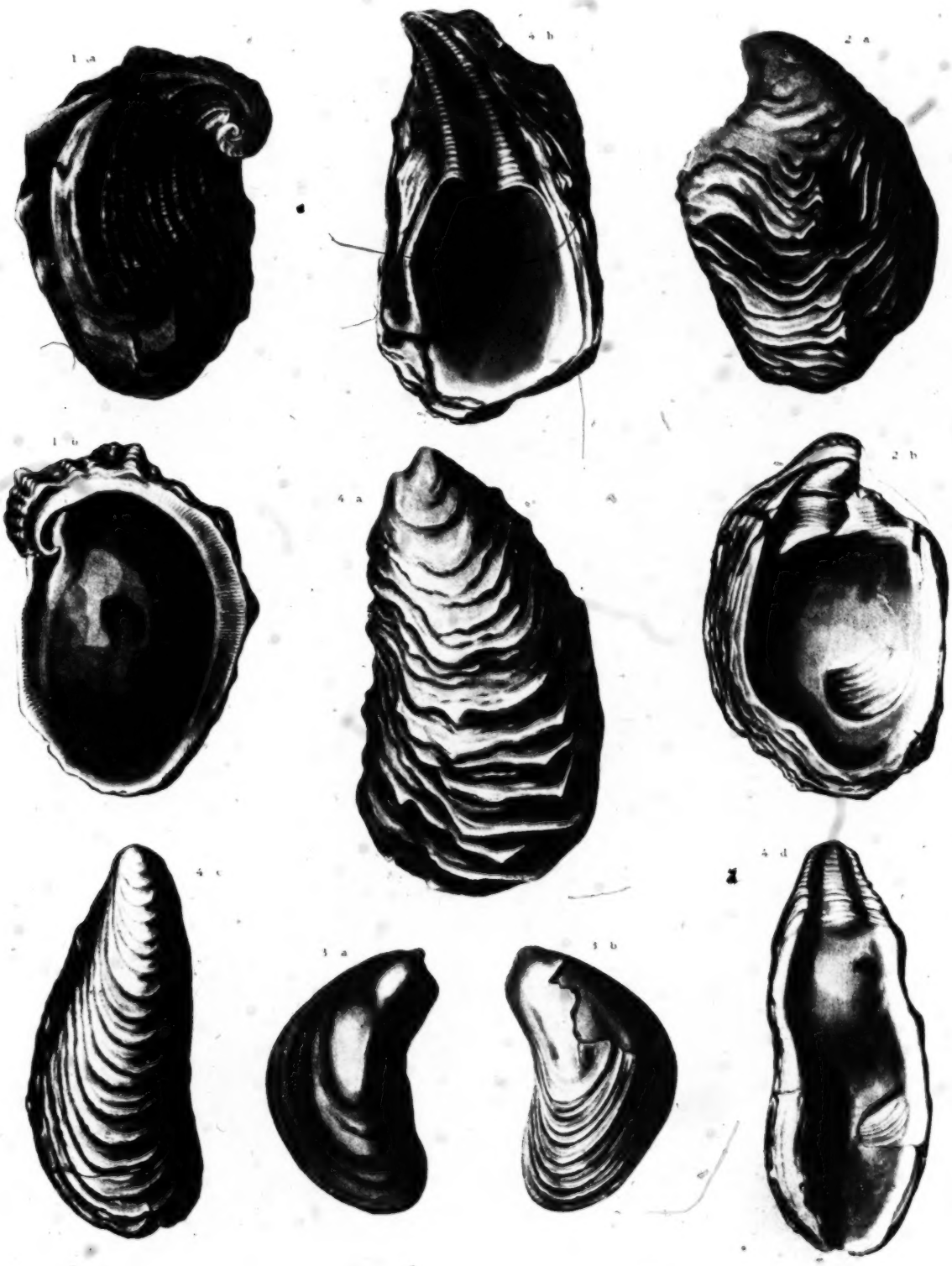
1 EXOGYRA COSTATA 2 GRYPHÆA PITCHERI 3 OSTREA SUBSPATULATA 4 OSTREA BELLA 5 OSTREA LUGUBRIS 6 OSTREA CARINATA





F B Meek Del

1 EXOGYRA MATHERONIANA. 2 OSTREA VELLICATA. 3 O ROBUSTA. 4 O CORTEX

1 a

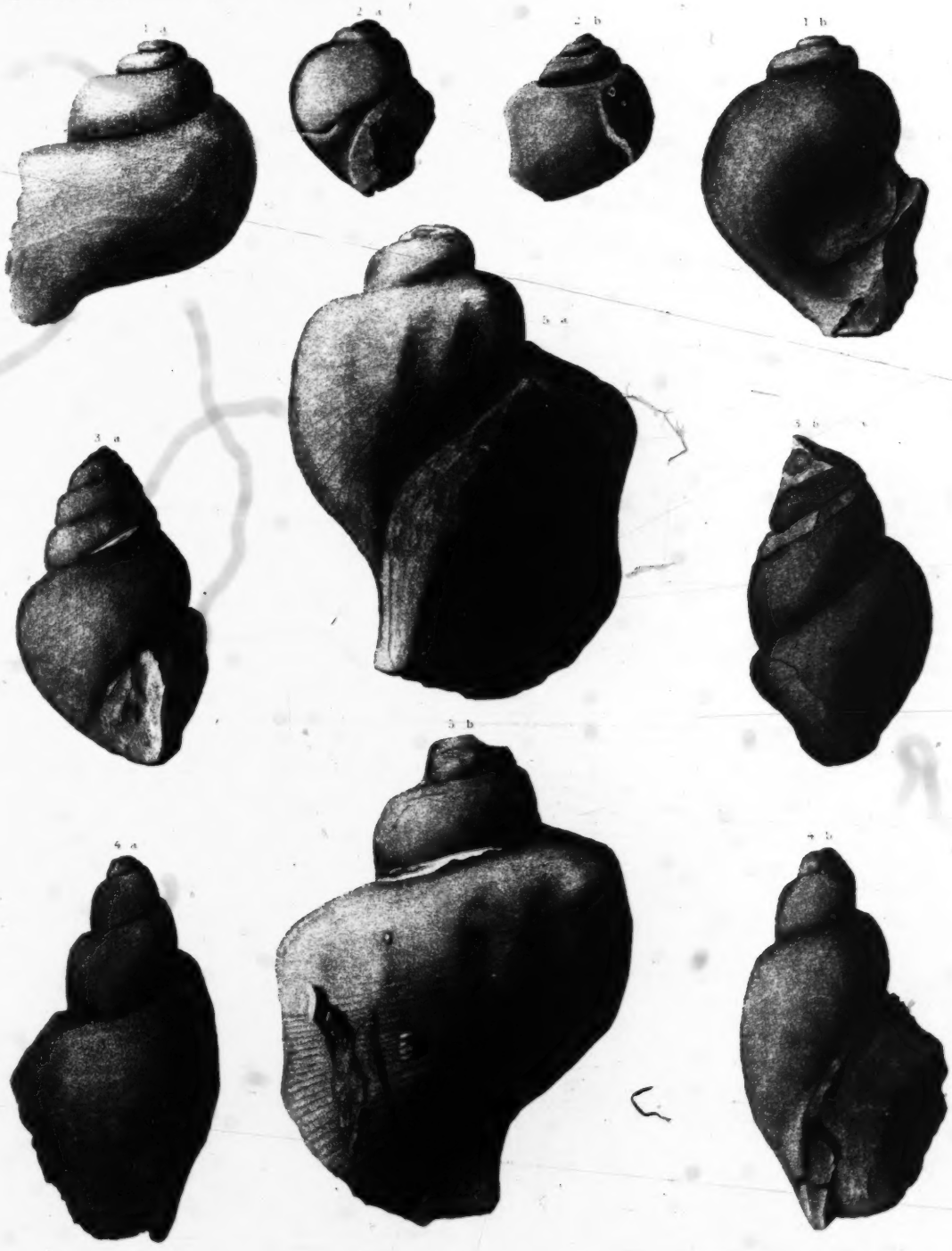
1 c

1 b

1 d

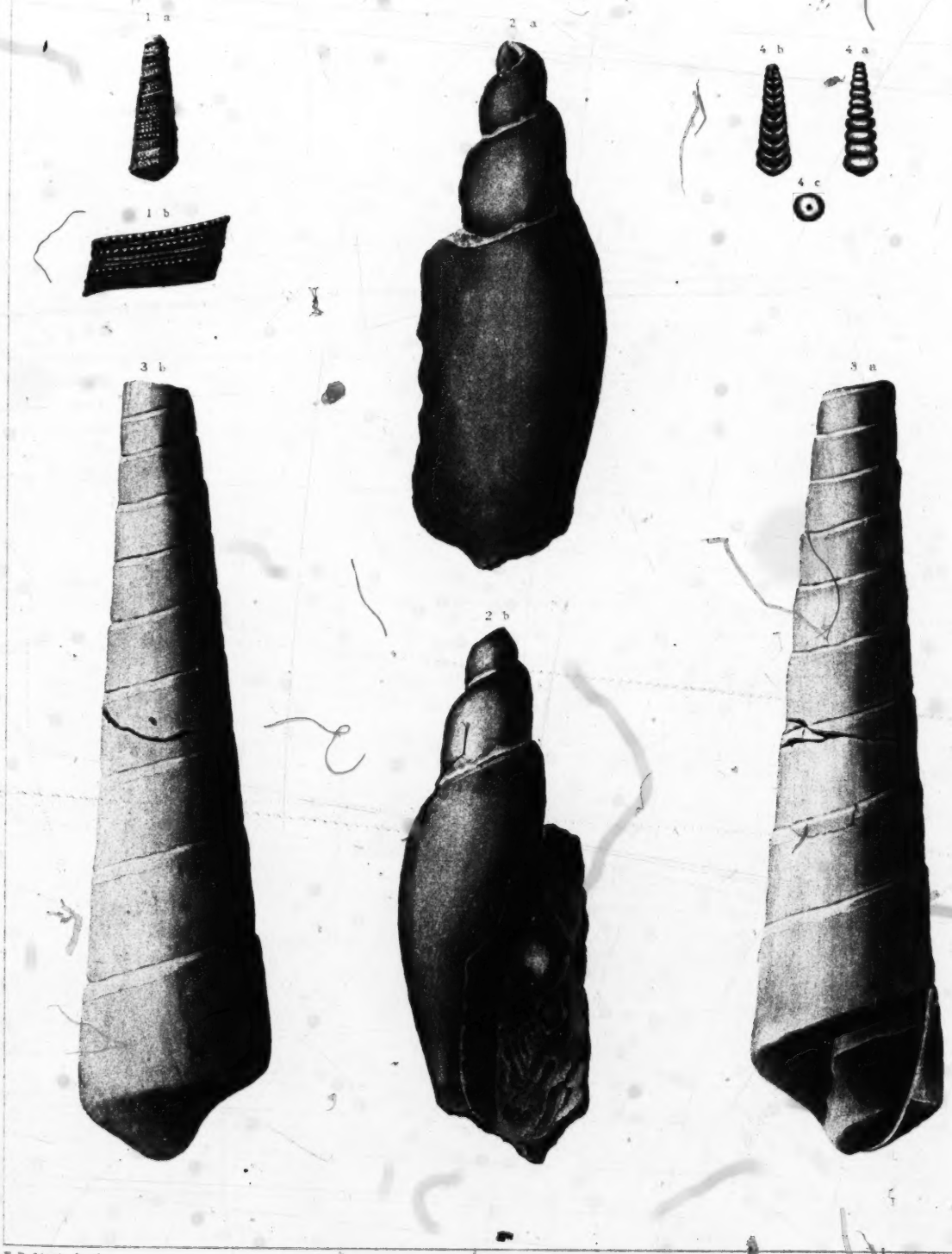
P.B.Meek del. J.E.Gann

1 OSTREA MULTILIRATA



F.B.Meek del

1 NATICA TEXANA. 2 NATICA COLLINA. 3 ROSTELLARIA? COLLINA. 4 ROSTELLARIA? TEXANA. 5 BUCCINOPSIS PARRYI.



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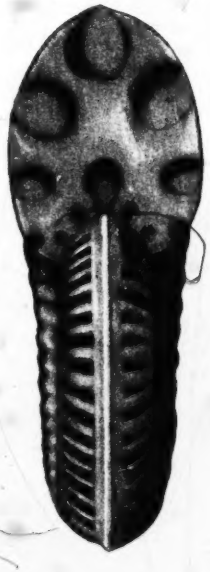
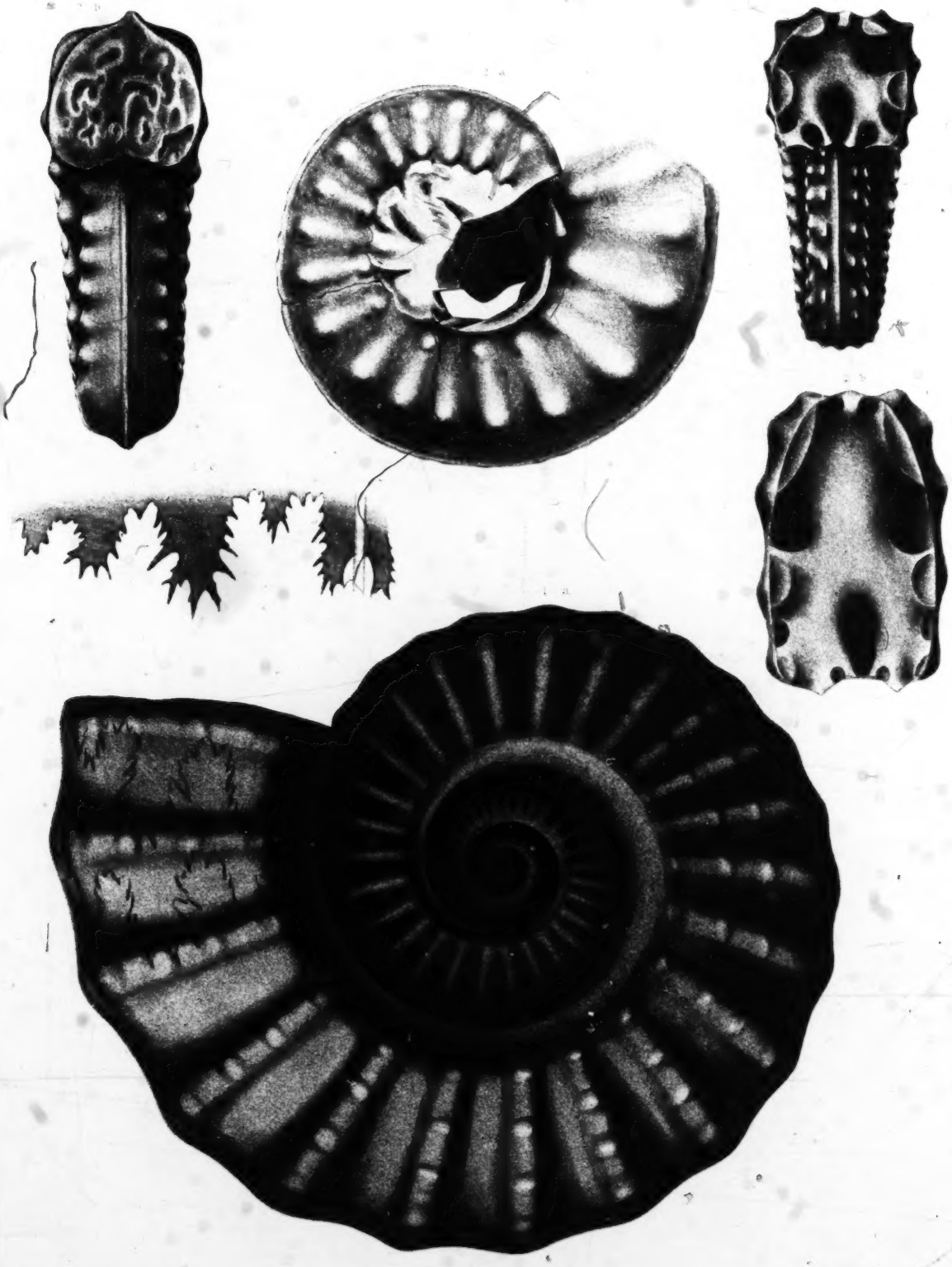
J.E.Gant sc.

1 TURRITELLA PLANILATERIS 2 ROSTELLITES TEXANA 3 NERINEA SCHOTTII 4 NODOSARIA TEXANA



1 AMMONITES PEDERNALIS VAR. 2 AMMONITES GENICULATUS



1 AMMONITES TEXANUS. 2 A. LEONENSIS.

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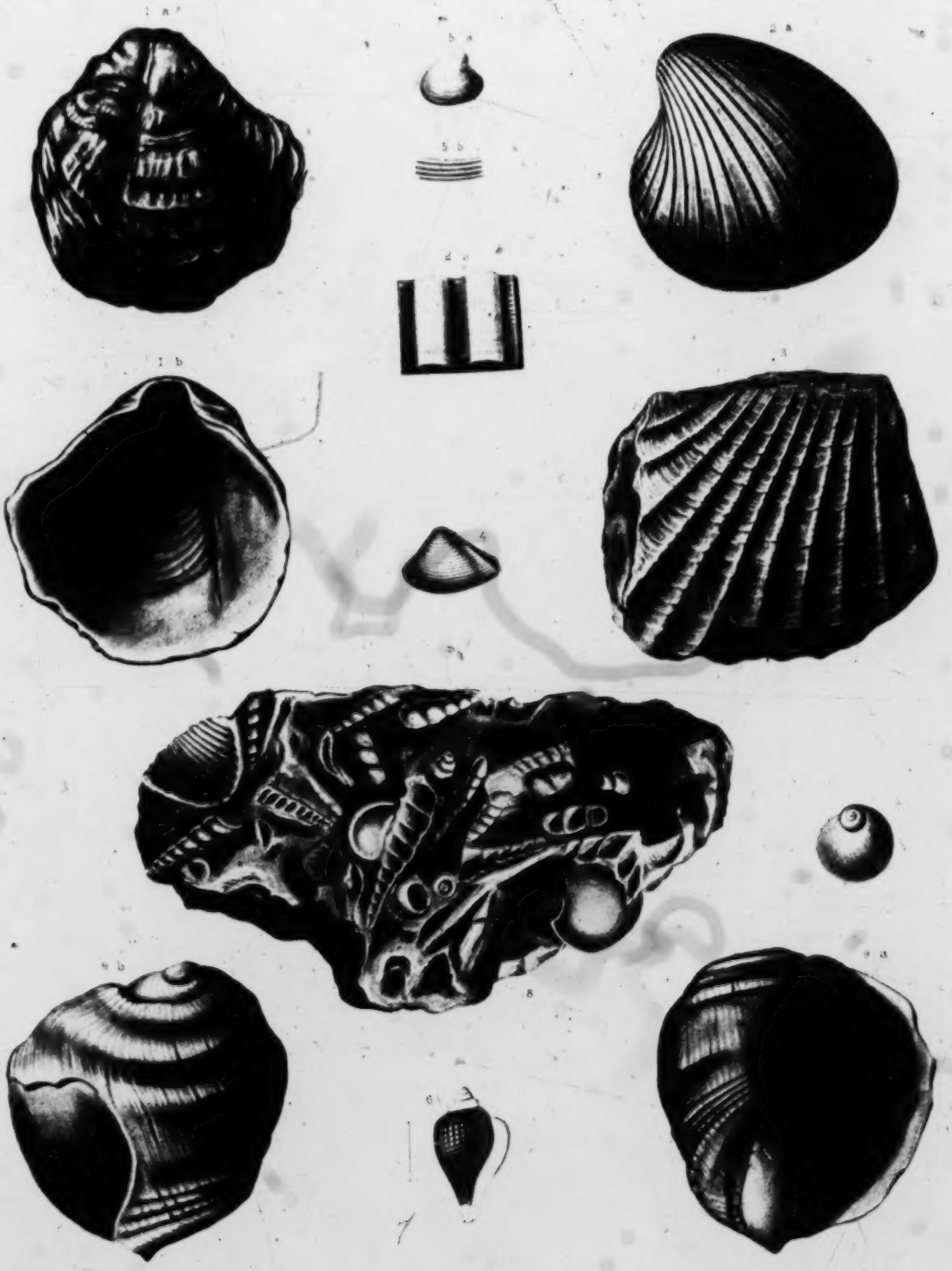
1 OSTREA VESPERTINA. 2 O. VELENIANA

F B Meek del

J E Gavit sc

1 OSTREA CONTRACTA

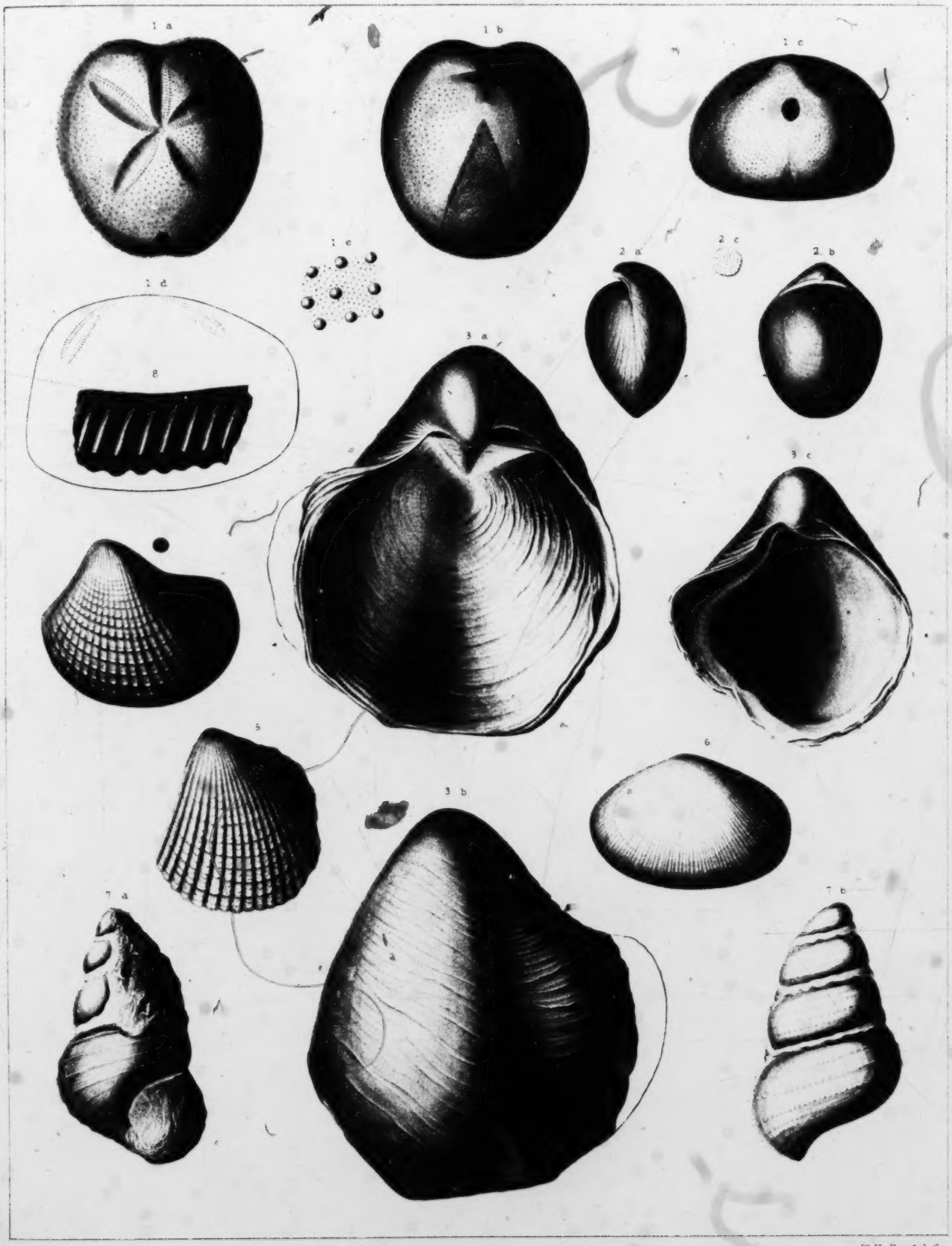


F.B.Meek Del W.H.Dougal Sc

1 ANOMIA SUBCOSTATA. 2 CARDITA PLANICOSTA. 3 PHOLADOMYA TEXANA.(Cretaceous) 4 CORBULA NASUTA. 5 VENUS VESPERTINA.
6 VOLUTILITHES SAYANA. 7 NATICA EMINULA. 8 TURRITELLA. 9 CASSIDULA (LACINIA) ALVEATA.

C.B Meek del

1 COLUMNARIA THOMII. 2 TEREBRATULA MEXICANA. 3 ORTHIS ARACHNOIDES. 4 EUOMPHALUS MICHLERANUS 5 ASAPHUS EMORYI



F B Meek Del. W H Dougal Sc

1 HOLASTER ELEGANS. 2 TEREBRATULA LEONENSIS. 3 GRYPHÆA PITCHERI. 4 PHOLADOMYA SANCTI-SABIÆ. 5 CARDITA SUBTETRICA.

34TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { Ex. Doc. No. 135.

REPORT

ON THE

UNITED STATES AND MEXICAN BOUNDARY SURVEY,

MADE UNDER

THE DIRECTION OF THE SECRETARY OF THE INTERIOR,

BY

WILLIAM H. EMORY.

MAJOR FIRST CAVALRY AND UNITED STATES COMMISSIONER.

VOLUME II.

WASHINGTON:
CORNELIUS WENDELL, PRINTER.
1859.

IN THE HOUSE OF REPRESENTATIVES.—MAY 19, 1858.

Resolved, That the resolution of this House of the 15th of August, 1856, which directs the printing of ten thousand extra copies of the Report of Major Emory on the Mexican Boundary Survey, be so far modified as to authorize the printing of three thousand extra copies, for distribution by the members of this House, of the second volume or appendix to said Report.

Attest:

J. C. ALLEN, *Clerk.*

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GENERAL BOTANY. . . . . By John Torrey, M. D.

CACTACEÆ. . . . . By George Engelmann, M. D.

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ZOOLOGY OF THE BOUNDARY.

MAMMALS. . . . . By S. F. Baird.

BIRDS. . . . . By S. F. Baird.

REPTILES. . . . . By S. F. Baird.

FISHES. . . . . By C. Girard, M. D.

UNITED STATES AND MEXICAN BOUNDARY SURVEY. DEPARTMENT OF THE INTERIOR.

PART I.

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1 k

PART II.

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INTRODUCTORY CHAPTER ON GEOGRAPHICAL DISTRIBUTION AND BOTANICAL FEATURES.

REPORT ON BOTANY.

REPORT ON CACTACEÆ.

INTRODUCTION.

INTRODUCTION.

BY C. C. PARRY, M. D.

GEOGRAPHICAL DISTRIBUTION.

Every observing traveller must have noticed how closely the peculiarities of the scenery of a country depend upon its vegetable productions. Not only is this true of trees and the larger forms of plants, but even the humbler, though apparently insignificant in themselves, have their share in producing the general effect. Hence the subject of the geographical distribution of plants is one which may command the attention of every intelligent mind, and this department of botany has for many an interest which the higher details of the science do not possess.

Perhaps no region of equal extent presents more marked illustrations of the relation of the vegetation of a country to its topography and geology than those afforded by that lying along the Mexican boundary line.

The usually difficult task of constructing a phytological map might here be performed with comparative ease, as the observer, little perplexed by a great variety or gradual blending of forms, involuntarily associates particular localities with the predominating and characteristic vegetable productions. Thus one who has ever traversed the desert table lands of the Upper Rio Grande will not fail to unite in his recollection of these tracts the dull foliage of the Creosote bush, the long thorny wands of the *Fouquieria*, the palm-like *Yucca*, and the crimson-flowered and spine-armed *Cereus*. Still less can any one, who has seen the giant cactus of the Gila in its perfection, ever forget the wild and singular features of the country in which it grows. The distinctness with which the botanical districts are defined gives an unpleasant sameness to the scenery of this country. The extensive plains exhibit a monotonous succession of the same forms, and each mountain slope and ravine presents us a collection of plants quite like those we have so often seen in other and similar localities. Indeed, the botanist in these regions, knowing what to expect in each different situation, soon loses his zeal, and becomes intent upon little else than overcoming space.

We propose to give a rapid sketch of the features presented by the vegetation of the country, especially noticing those plants which predominate in, and give character to, the several districts into which we have divided it.

THE LOWER MARITIME BELT.

The flora of this strip of country is too well known to require an account here, had we the necessary data for describing its characteristic botanical productions. Its position being intermediate between the "tierra caliente" of Mexico and the gulf coast of Louisiana, gives to its vegetation a mixed character, partaking of that of the two extremes. Thus, while upon the

lower portion of the Rio Grande, we have the sub-tropical character of its vegetation indicated by the presence of the arborescent palms of the "tierra caliente," we have at the same time the Texas live-oak, the type of a more northern flora. This region has been more thoroughly explored by A. F. Schott, esq., whose observations upon its botany and other natural features will be found in a separate memoir.

UPPER MARITIME BELT.

To the lower belt, which has an uniform alluvial soil, and is more or less influenced by its vicinity to salt water, succeeds rolling prairies, underlaid by cretaceous rocks, which now for the first time appear, though more or less hidden from view by a thick layer of erratic and alluvial deposits. This division includes, as we have already noticed, the most habitable parts of Texas, through which run the numerous rivers which empty into the Gulf of Mexico. Here we find rich cotton lands, and an abundance of trees, including species of oak, hickory, ash, elm, walnut, cypress, &c., with an exceedingly rich undergrowth of vines and shrubbery. The open prairies are densely covered with luxuriant grasses, and have a rich and varied flora, which has been well explored by the early labors of Drummond, and later by those of Lincheimer and Wright. Upon the southern portion of the Rio Grande, where there is a higher temperature, united with greater aridity of the soil, a vegetation of quite a different character appears; we have here the dense growth of "chapparral," which is so peculiar to this region. The plants which make up the thick mass of shrubbery known by this name are different species of *mimosa* and *acacia*, with the well known mezquit and other forms, most of which are armed with hooked thorns, and make up a jungle which is almost impenetrable.

The botany of this region is too well known, from various published accounts, to require further details in this place.

VEGETATION OF THE CRETACEOUS FORMATION.

As the geological formation becomes more exclusively cretaceous the vegetation assumes a peculiar character, and is made up of species which are rarely found elsewhere. The shrubbery of this region presents a continuous succession of the same forms, among which are *Berberis trifoliolata*, *Rhus microphylla*, *Porliera angustifolia*, *Diospyros Texana*, *Roeberlinia spinosa*, *Adolphia infesta*, *Microrhamnus ericoides*, and *Acanthoceltis*, a new genus of Engelmann, allied to *Celtis*. Along the margins of the usually dry water courses the dwarf walnut (*Juglans rupestris*) and *Fallugia paradoxa* are constantly found.

The perennial herbaceous plants of this district are numerous. The rocky ledges produce in their crevices various species of *Laphamia* and the scarlet flowered *Pentstemon Grahamii*. Several examples of the large tropical family of *Malpighiaceæ* are found here, among them *Galphimia linifolia*, *Aspicarpa hyssopifolia*, and *Janusia gracilis*. Cacti are numerous, and include among the forms here presented opuntias, mammillarias, and numerous species of cereus. The curious *Lycopodium dendrolobium* grows upon the perpendicular faces of the limestone rocks. This plant commonly called "rock rose," is remarkable for the hygrometric qualities of its fronds, which are usually rolled up so that the plant forms a dry ball, which expands under the influence of moisture, and then appears fresh and vigorous. Several new species of *Cheilanthes*, *Pteris*, *Notoclæna*, and other genera of ferns are found here.

Upon the rocky ledges a small species of agave grows in abundance. The low leaves, which are pointed with sharp spines, are very troublesome to the foot traveller; they are, however, of some use to the Mexicans, who employ the strong fibres they contain in making coarse ropes. The plant is known to the people of the country as "Lechaguia." The table lands and valleys are usually covered with an abundant growth of "grama grass," and among it are frequent clumps of *Dasylirium*, or "bear's grass."

We have here also several interesting species of *Nyctaginaceae*, belonging to the new genera, *Acleisanthes*, *Pentacrophis*, and *Selenocarpus*, lately proposed by Dr. Gray.

Among the annual plants of this district are several species of *Mentzelia*, *Perezia*, *Pectis*, *Hymenatherum*, &c., also the pretty *Eucnide lobata*, which usually grows in almost inaccessible situations upon the perpendicular faces of the limestone ledges.

There are so many species that seem to be equally abundant that it is difficult to designate any as being characteristic of the cretaceous district.

VEGETATION OF THE HIGHER BASIN PLAINS AND THE ADJOINING MOUNTAIN RIDGES.

The higher alluvial tracts, forming the basin plains before described, produce a number of northern forms of plants, such as species of *Œnothera*, *Gaura*, *Riddellia*, *Zinnia*, and *Polygala*. We also find here the curious *Peganum Mexicanum* and *Peteria scoparia*, the latter a pretty plant of the family *Leguminosæ*. The depressions in this alluvial region are covered with a coarse grass, which presents an uniform dead brown color throughout the greater part of the year. In the deep recesses and shaded valleys, the vegetation has a freshness unknown to that of the plains. In these localities we encounter the upland live oak (*Quercus Emoryi*, and the nut pine, (*Pinus edulis*,) and growing beneath these, *Vitis incisa*, *Clematis Pitcheri*, *Ungnadia speciosa*, &c. The constant presence of water in the larger valleys is marked by the growth of cotton wood and willows.

VEGETATION OF THE EL PASO BASIN AND THE UPPER RIO GRANDE VALLEY.

The vegetation of the immediate valley of the Rio Grande, and that of the country immediately adjoining it upon either side, are strikingly different, and whoever passes from the valley, and crosses the line of mountains which bounds it to the regions beyond, cannot but remark the difference in the landscape, due to the presence of new plants. Upon the table lands which spread out beyond the mountain barrier, the eye falls upon a great variety of plants, none of which are seen in the more fertile valley. Among these are *Fouquieria splendens*, *Larrea mexicana*, *Flourensia cernua*, *Rhus microphylla*, *Condalia obovata*, *Koeberlinia spinosa*, and species of *Krameria*, *Ephedra*, and *Yucca*. There the *Cacti* flourish in a congenial soil, and we find representatives of the genera *Opuntia*, *Echinocactus*, *Mammillaria* and *Cereus*.

Among the numerous herbaceous and suffruticose plants of these localities we may mention *Cevallia sinuata*, *Greggia camporum*, *Eriogonum Abertii*, and several species of *Dalea*; plants of the family *Compositae*, are especially abundant, and include among others *Baileya multiradiata*, *Bahia absinthifolia*, *Porophyllum scoparium*, *Psathyrotes scaposa*, *Hymenatherum acerosum*, *Townsendia strigosa*, *Calycoseris Wrightii*, *Stephanomeria minor* and *Rafinesquia Neo-mexicana*.

The natural order of *Nyctaginaceæ* is represented by *Selenocarpus chenopodioides*, *Boerhaavia Wrightii*, and others.

The principal grasses of this region consist of the kinds known as "bunch grass," and belong to the genera *Chondrosium* and *Bouteloua*. The margin of the table land, where it

borders upon the valley is broken by deep ravines, and we find here upon the sandy bluffs a growth of chaparral, made up principally of mezquit and the equally thorny acacias. In the dry pebbly water courses, the willow-leaved *Chilopsis linearis* frequently occurs. Many of the already mentioned plants of the table land are found here, besides others, which are peculiar to these localities, such as *Dithyræ wislizenii*, *Abronia mellifera*, *Gilia longiflora*, *Lepidium alyssoides*, *Gaillardia pinnatifida*, *Palafoxia Hookeriana* and *Tetraclea Wrightii*, a singular genus of *Verbenaceæ*, recently described by Dr. Gray. In the valley of the Rio Grande we frequently find a heavy growth of cotton wood and willows. The "screw bean," *Strombocarpa pubescens*, often occupies large tracts, accompanied by a dense undergrowth of *Baccharis salicina*. The low saline places produce an abundance of *Obione canescens*, while on the higher ground, *Tessaria borealis* is a common plant.

A number of coarse composite plants are found in the valley, such as *Texmenia encelioides*, *Coreopsis cardaminefolia* and *Aster spinosus*, the latter often forming dense matted masses of considerable extent.

The rocky crevices of the adjoining mountains furnish some of the most interesting plants of this region. We here find *Fendleria rupicola*, *Mortonia crassifolia*, *Glossopetalon spinescens*, *Agenia parvifolia*, *Bouvardia hirtella*, *Tecoma stans*, *Texmenia brevifolia*, &c.

The higher mountains of the Organ range have a vegetation possessing a somewhat alpine character, and bear a scattering growth of pines and oaks, beneath which flourish a number of shrubby and herbaceous plants, quite similar to those found upon the more lofty ranges further to the west.

VEGETATION OF THE SIERRA MADRE.

As we approach the base of the Sierra Madre, passing over the extensive basin-plain already described, a gradual increase in the elevation is marked by a disappearance of those plants, which were common lower down, and the presence of others wearing a more alpine aspect. The surface is less bare than upon the plain below, and is covered with a closely matted grass, which gives a singularly rounded outline to the undulating land around the base of the mountain. Along the lower rocky swells grows the beautiful *Carphochete Bigelovii*, with *Anemone Caroliniana*, *Streptanthus linearifolius*, *Pentstemon Torreyi* and *Fendleri* are among the characteristic plants of these localities. There are but few shrubby plants, several species of *Ephedra* being among the most conspicuous. The streams are bordered by *Fraxinus velutinus* and *Juglans rupestris*, (the large variety,) and in moist places an old Californian acquaintance, *Anemiopsis Californica* makes its appearance.

Upon the mountains oaks and pines are found, mostly *Quercus Emoryi* and *Pinus edulis*, though in certain localities there is larger timber, consisting of *Pinus Chihuahuana* and *Abies Douglasii*. The smaller woody growth here includes several species belonging to the Californian mountain flora, such as *Cercocarpus parvifolius* and *Arctostaphylos tomentosus*.

Upon the summit of Ben More, further to the north, Dr. Bigelow discovered many plants indicative of an alpine flora, among these were *Frasera speciosa*, *Rubus Neo-mexicanus*, *Actinella Richardsonii*, and, perhaps, most remarkable of all, a small fern, *Asplenium septentrionale*, an European species not before detected on this continent.

The abrupt descent through Guadaloupe pass, upon the western slope of the ridge, presents a profusion of evergreen shrubs and flowering plants, including most of those which occur on

the summit ridge. Live oaks grow upon the rocky sides of the ravines, and with them is frequently associated a species of cedar. Among the more interesting of the herbaceous plants found here, are *Dryopetalon runcinatum*, *Vesicariæ*, and *Colomiæ*. The narrow valley of the stream which runs through the bottom of the Pass is wooded with ash, cotton wood, and Mexican sycamore.

VEGETATION OF THE UPPER VALLEYS OF SAN BERNADINO, SAN PEDRO, AND SANTA CRUZ WITH THAT OF THE ADJOINING MOUNTAIN RANGES.

The country embraced in the above limits, includes that portion of Northern Sonora, which divides the waters which flow north towards the Gila river from those whose course is south, towards the Gulf of California. It is, as we have before stated, diversified with high wooded mountains and upland plains, well watered valleys and dry and barren tracts. The arborescent growth is not essentially different from that we have noticed in speaking of the other divisions of country. Live oaks, the nut pine, cedar, ash, walnut and cotton wood are produced either upon the mountains or in the upland valleys. Its plains are covered with an uniform growth of upland grama grass, or in the more arid localities by mezquit and its thorny associates. This region furnishes a number of singular and highly interesting genera and species, most of which are described by Dr. Gray, in the second part of "Plantae Wrightianæ," in the Smithsonian Contributions. A reference to this work will give a better idea of the character and distribution of the flora of this district than our limits will allow us. As it occupies a station between several botanical divisions, so its flora partakes of that of those regions. The following list of some of the plants found here will be seen to embrace species belonging to California, Texas, Mexico, and New Mexico, viz: *Eschscholtzia douglasii*, *Zauschneria Californica*, *Eulobus Californicus*, *Bowlesia tenera*, *Anemone Caroliniana*, *Draba caroliniana*, *Corydalis aurea*, *Androsace occidentalis*, *Rutosma texana*, *Erodium texanum*, *Layia Neo-mexicana*, *Cowania Mexicana*.

VEGETATION OF THE LOWER SANTA CRUZ VALLEY, THE DESERT OF TUCSON, AND THE CENTRAL VALLEY OF THE GILA.

The region defined as above constitutes a very distinct botanical district, many of its peculiar plants not being found elsewhere. As we have mentioned in a previous sketch, the valley of the Santa Cruz, as it leaves the mountains in its northward course towards the Gila, gradually looses its fertile character, and finally terminates in the desert plain which forms the table land of the Gila. The vegetation of this tract comprises many of the forms which are found on all the barren plains of the country. Here, as in similar situations elsewhere, the mezquit and the creosote bush are conspicuous. Cacti are abundant here, and of various types. There are the low arborescent *Opuntias*, generally bearing proliferous fruit, as well as several elliptical-stemmed species. The enormous *Echinocactus wislizenii* and *Caespitose mammillarius* and *Cerei* are common, while, either standing solitary or collected in groups, the lofty *Cereus giganteus* towers above all. A species of misletoe is common upon the mezquit trees of this region.

The sheltered crevices of the neighboring mountains produce a species of agave, and in these localities we find *Franseria deltoidea*, *Encelia farinosa*, and *Perityle nuda*.

After the occurrence of rains the open plans are carpeted by a profusion of bright colored evanescent annuals, among the most conspicuous of which are *Vesicaria*, *Eschscholtzia Douglasii*.

A scanty growth of annual grama grass grows beneath the ever abundant *Larrea*, and the more alluvial portions of the tract are occupied by *Obione canescens*. In the deep cracks of the smooth washed surface *Bowlesia tenera* and some species of *Hosackia* are found. Near the immediate valley of the Gila we encounter species of *Œnothera*, *Simsia*, *Gaillardia*, and *Oligomeris glaucescens*.

The valley of the Gila has many features in common with that of the Rio Grande, and among the botanical productions common to both valleys we notice *Tessaria borealis* and mezquite, which latter forms dense "chaparral." The trees bordering the stream are mostly cotton wood and willow.

VEGETATION OF THE RIO GRANDE, CAÑONS, AND THE CONNECTED BASINS.

The flora of the cañons of the Rio Grande differs but little from that of the mountain ravines we have already alluded to. We find stunted shrubs rooted in the crevices of the rocks or scattered along the broken summits. The abrupt walls, whether of limestone or of igneous rock, afford favorable places for the growth of such plants as affect inaccessible localities. Here we meet two species of the well characterized genus *Laphamia*, viz: *L. dissecta* and *L. bisetosa*; also *Perityle aglossa* and *L. Parryi*, the pretty *Eucnide lobata*, *Cowania ericifolia*, and *emoryi*, a new genus of the order *Scrophulariaceæ*, dedicated to Major Emory.

In open places the vegetation peculiar to table lands makes its appearance.

In the more extensive basin of Presidio del Norte the flora partakes of the character of that of Mexico, and more tropical forms prevail. We find here *Kallstroemia grandiflora*, *Martynia violacea*, *M. arenaria*, *Talinopsis frutescens*, *Nicolettia Edwardsii*, and several species of *Boerhaavia*. *Cereus Greggii* is quite common, and the delicious fruited *Cereus stramineus* grows in its greatest perfection.

All the basins and cañons within these limits present a similar vegetation to the one just noticed.

In the Chisos basin a remarkable shrubby plant, allied to *Scutellaria*, was discovered. This Dr. Torrey has described as *Salizaria*, a new genus of the order *Labiatæ*. It has a straggling habit, and grows along the gravelly margins of dry water courses. The Sierra Carmel, upon the summits of which we should expect to meet with many botanical novelties, was passed, in a necessarily hurried march, in the month of November. Under these circumstances but little information could be obtained respecting its flora. Live oaks and the nut pine grew upon the higher ridges, and its upland plains and valleys were covered with luxuriant grama grass. The beautiful Santa Rosa valley is marked by the most attractive scenery. Its broad and fertile plains, with copious streams, bordered by gigantic cypress, sycamore, and pecan trees, with a back ground of high mountains, form a landscape upon which the traveller, wearied by the monotony of the sterile table lands, gazes with the keenest enjoyment.

From this point, on approaching the lower course of the Rio Grande, lying to the southwest, there is a sudden transition to the forms of vegetation before alluded to as characterizing this arid and thorn beset district.

AGRICULTURAL CAPACITIES.

We have attempted to give a sketch of the external features and spontaneous vegetation of the region of country along the United States and Mexican boundary line. It now remains to notice its adaptation to agriculture, and our remarks regarding this may all be embraced in one general conclusion.

Wherever the supply of water is constant, and sufficient for the purposes of irrigation, or wherever the regular overflow of the rivers can be relied upon to supply the amount of moisture required for the growth of crops, independently of the rains, in those places, and in those only, can agriculture be pursued with success.

The portions of the country best suited to cultivation are those which are capable of irrigation. For these the supply of water is obtained, not only from the larger rivers, as the Rio Grande and Gila, in which the head of water is increased by the construction of dams, but springs and small water courses, these often lying in mountainous situations, are laid under tribute.

In the course of the preceding sketch we have noticed the fact that the lower portions of the numerous valleys are of a sterile and unproductive character, for the reason that the water of the streams is absorbed before it reaches the portions which lie farther below, where, instead of a running stream, we only find a sandy bed, with the adjoining region unfit for the purposes of cultivation.

Those places which are supplied with the necessary moisture by the overflow of the rivers have a still more precarious dependence than those where irrigation is practiced. In these the quantity of water cannot be regulated, and they are exposed to the two extremes of scarcity or superabundance. One of the best examples of this system of cultivation is seen at Presidio del Norte, where the Concho unites with the Rio Grande. As these two rivers have different periods of high water the inhabitants are enabled to frequently secure two crops from the same fields in one season. In order to accomplish this the first crop, depending upon the overflow of the Rio Grande, must be sown and harvested in time to admit of the planting of the second crop, depending upon the later rise of the Concho. All this depends upon so many contingent circumstances that it is oftener attended by disappointm than by success, and, between the extremes of flood and drought, the people frequently suffer for want of food.

We have already noticed that a large extent of country, though destitute of streams to supply the water required in cultivation, receives from the atmosphere and clouds, in the form of dew and rain, sufficient moisture to permit the growth of the richest pasturage, and we have large districts of unequalled grazing lands, so broad and so abounding in herbage as to compensate for their deficiencies in other respects. Here the buffalo and antelope have already given place to wild cattle and horses, and we look for the time when these shall yield in their turn to domesticated flocks and herds, denoting that nomadic barbarism has been supplanted by civilization, with its ameliorating influences.

Many large tracts of this country must ever remain as deserts, being alike destitute of vegetable and mineral resources; but even these otherwise valueless regions are the very portions which present the fewest impediments to travelling, and, indeed, form natural highways to otherwise inaccessible parts of the country.

Other facts connected with this part of the subject, as regards character of climate and general

habitable condition of different sections of the country, will be dwelt on by others, or may be left to inference from what has been already noted.

BOTANICAL FEATURES.

The general botanical features of the region under examination next claim our attention, and in elucidating them, we shall be guided by the great natural divisions of country already indicated, as these furnish us plain lines of demarcation for separate botanical districts. Thus, there is a group of plants growing in the immediate vicinity of the sea, and which characterize the *Littoral Region;* above these, and confined more or less closely to the base of the mountains, is found another group indicating the *Supra-Littoral Region;* next to this, in the ascending order, is what may be termed the *Lower Mountain Region*, with a still different vegetation; and lastly, the *Proper Mountain Region*, producing plants peculiar to elevated localities.

LITTORAL PLANTS.

Among the exclusively littoral plants, some are common to the seacoast of nearly all countries; and these, such as the common *Salicornia*, are found here, and it is our intention to notice only those which are peculiar to this particular coast. We mention, first of all, two species of *Abronia*, (*A. arenaria* and *A. umbellata*,) which spread their trailing branches over the sand dunes which edge the sea-shore, and with their abundant foliage and beautiful umbelled flowers, give relief to the barren features of the landscape.

Growing with the *Abronias* a species of ice-plant (*Mesembryanthemum*) is frequently found. This has spreading succulent stems and triangular leaves. Its showy, though evanescent, pink flowers appear only in bright sun-light, and are succeeded by an edible, juicy fruit. In the same region, though less closely confined to the sea-beach, is another species of this genus, probably identical with the well known *M. crystallinum*. Here it is an annual, attaining its full size in the month of June, when it may be seen in large patches several rods in extent, presenting a thick bed of showy flowers. The leaves and stems are beset with shining glandular little warts, which contain a strongly saline fluid. The flowers, which are ephemeral and very abundant, appear in regular succession from June to August. After the flowering period the plant withers and dries up, leaving a thick mat of seed vessels, which remain closed until the commencement of the rainy season; the hygrometric tissue of the capsule then expands, under the influence of moisture, and the enclosed seeds escape and commence germinating. The dry remains of the plant are frequently burned for the sake of the ashes, which, being strongly alkaline, are used in making soap. Both the species here mentioned are so characteristic of the places they occupy that they would seem to be indigenous, but it is generally thought by botanists that they are introduced.

Among other plants characteristic of this region are *Œnothera viridescens*, (Hook.,) *Franseria bipinnatifida*, and a species of *Statice*, which grows near the head of San Diego bay, and seems hardly distinct from *S. Limonium*.

The common *Salicornia* here acquires a shrubby growth, and is frequently entwined with a species of *Dodder*, and accompanying it is found a new species of *Batis*, to which Dr. Torrey has given the name of *B. Californica*. *Frankenia grandifolia* grows here abundantly, associated with *Layia carnosa*, *Aromia tenuifolia*, and *Tuckermannia*. Among the shrubs peculiar to this

region may be noticed *Styphonia serrata*, with its thick evergreen leaves and *Obione canescens*, which is very abundant. A species of *Lycium*, with yellow flowers and red berries, is also conspicuous. This brief enumeration will serve to give a general idea of the characteristic vegetation of what we have termed the Littoral Region.

SUPRA-LITTORAL REGION.

Leaving the salt water, to the influence of which the characteristics of the preceding region are due, we come to the Supra-Littoral district, which presents a more striking variety in its vegetable forms.

This region includes a large proportion of shrubbery, to which, as it imparts peculiar features to the scenery, we shall especially direct our attention.

Before enumerating the plants which make up this woody growth, we would remark, that nearly all the shrubs of this region are inclined to form a stunted and bushy growth, which is evidently caused by exposure to dry seasons and sea breezes. There is also to be noted a leaden color of foliage, which does not depend upon the abundant growth of *Artemisiæ*, most of which possess this tint, but is common to a large proportion of the shrubs of this region. Both of these peculiarities of the vegetation have their influence upon the character of the landscape.

One of the most striking shrubs is *Eriogonum fasciculatum*, a neat evergreen, with small pink flowers, disposed in crowded umbels at the summit of prolonged stalks. Its season of flowering is during the midsummer, and it is generally characteristic of arid and barren tracts. *Isomeris arborea* (Nutt.) is frequently associated with this plant, and is distinguished by its yellow flowers and singular bladder-shaped pods. Here is also found *Rhus aromatica*, (Nutt.,) which frequently acquires quite an arborescent growth and occupies extensive tracts. It is clothed with shining evergreen leaves, which resemble those of the holly and exhale a strong odor like that of laurel. We also meet with *Photinia arbutifolia*, a handsome and often symmetrically formed shrub. This has rich evergreen foliage and beautiful bunches of white flowers, which are succeeded by scarlet berries. In favorable localities this sometimes attains the height of twenty feet, with a trunk six inches in diameter at the base. Another shrub deserving especial notice is *Simmondsia californica*, (Nutt.,) which has persistent leaves of a pale green color, and inclined to assume a vertical position. The plant is dioecious; the mature fruit is about the size of a hazel nut, and has a thin smooth three-valved husk, which separates spontaneously when ripe, disclosing a brown triangular kernel. This fruit, though edible, can hardly be termed palatable; its taste is somewhat intermediate between that of the filbert and acorn. It is, however, employed by the Indians as an article of diet, and is called by them "jajoba." The range of the *Simmondsia* extends to the base of the mountains, and it is found again, in similar situations, upon the eastern side, though less abundantly, as well as in the upper valley of the Gila, where it was detected by Major Emory, in 1846. Besides the shrubs above enumerated, the *Artemisia Californica* is widely diffused over this region; this is employed by the Mexicans as a popular remedy against cholera, under the name of "*Estafiat.*"

On the San Diego promontory there is a dense and intricate growth of shrubbery, to which both the people from the town and from the shipping have for a long time resorted for fuel. The greater proportion is furnished by *Eriodictyon*, which is a large shrub of from eight to twelve feet in height, with a diameter of from two to four inches. The wood is very close-grained, but brittle, and is charged with a resinous matter, which causes it to burn readily, even

when green. In this locality are also found the beautiful *Ceanothus rigidus*, *Pitavia dumosa*, *Adenostoma fasciculata*, and a species of scrub oak, all forming dense thickets.

We must not omit to mention the *Cactaceæ*, which here present species of all the extra tropical genera, as remarked by Dr. Engelmann in his memoir upon this family. These plants, from their striking and singular forms, impart a characteristic feature to the region they inhabit.

A new species of pine is peculiar to the district now under consideration. It occupies an arid tract near the ocean beach, about twelve miles north of San Diego, at the entrance to Solidad valley. In this locality (the only one in which it has been found) it forms a small sized tree, with rather open foliage. It is particularly distinguished by its long fascicles of leaves, which are in fives, and its large ponderous cones. This species, the specific characters of which will be found more fully described in the following list, I have ventured to designate, in compliment to a distinguished American botanist, as *Pinus Torreyana*.

Along the borders of the streams which traverse this Supra-Littoral district are found the common cotton-wood, (*Populus angustata*,) the *Platanus Mexicanus*, and, in the lower portion of the San Luis Rey valley, an *Alnus*; these, with various species of willow, make up the proper timber growth of this region. The undergrowth in these localities consists mainly of coarse representatives of the order *Compositæ*, conspicuous among which are several shrubby species of *Baccharis*. In moist places *Anemiopsis Californica* is frequently met with, and where the soil is rich the surface is covered by a rank growth of wild mustard (*Sinapis nigra*) and mallows, (*Malva obtusa*.)

The herbaceous and annual plants of this region are so numerous that we can only allude to a few of the more striking and characteristic.

It is in the latter part of winter and during the earlier spring months that California puts on her richest floral garb. Then the arid hills assume an aspect far different from their desert-like summer appearance. In February the moistened ground becomes arrayed in an assemblage of varied tints. The pale blossom of the elegant *Dodecatheon integrifolium* nod on every hill side, blue *Lupines* and rainbow colored *Gilias* deck the ground, and various ferns and mosses appear. The *Ribes speciosum* hangs its scarlet pendants, and the rich yellow flowers of *Viola pedunculata* are abundant everywhere. Even the numerous northern genus *Saxifraga* is represented here by more than one species. A large number of *Hydrophyllaceæ*, including species of *Nemophila*, *Phacelia*, and *Eutoca*, are among the early tokens of spring, while the orange colored flowers of *Escholtzia*, the pale blooms of *Platystemon*, and the pink ones of *Meconopsis*, show that the poppy family contribute largely to make up the vernal flora. Among the twiners are a species of *Clematis* that is either new or a variety of *C. pauciflora* and *Megarrhiza Californica* of Torrey; the latter plant, which hangs its prickly burs from almost every bush, is remarkable for the enormous size of its root. Further to the north the valleys are clothed with a luxuriant growth of wild oats, (*Avena fatua*,) which is so extensively naturalized that it gives to every fertile tract the appearance of a cultivated field. The wide plains that border the sea in the neighborhood of Los Angeles are covered with the richest pasturage. The *Erodium cicutarium*, (called here "pin grass," and furnishing a highly esteemed fodder,) with several species of wild clover, (*Trifolium* and *Medicago*,) are mingled with a variety of other herbage, and thus serve to give a meadow-like aspect to this teeming land. Such is the general appearance of the country from February to April, inclusive, and then is to be seen the glory of the Californian flora.

THE LOWER MOUNTAIN REGION.

As we begin to enter the mountain range we come upon what we have termed the *Lower Mountain Region*, the intervening slope between the base of the mountain and the summit ridge. Here the species of plants last considered disappear, and are replaced by an almost entirely different assemblage of vegetable forms.

The *Adenostoma fasciculata*, which we have before alluded to, is frequently found covering entire hills. This plant is not peculiar to this region, but grows on all exposed situations, from the lowest to the most elevated. It has fine and thickly set dark green foliage, and forms a conspicuous feature in the landscape. From its habit of growth it may be considered as the heath of this country, though it belongs to a different family, that of the *Rosaceæ*.

As the *Artemesias* disappear, scrub oaks show themselves on the steeper mountain slopes; and, as the valleys become narrower and more rocky, we find the California live-oak (*Quercus agrifolia*.) This forms a large spreading tree, the holly-like evergreen foliage of which adds to the beauty of the mountain scenery. In the more northern sections of the country this oak is met with in the vicinity of the sea; but as far south as San Diego it grows upon the mountain slopes only, and its presence denotes a considerable elevation. It is usually of stocky growth and unwieldy shape. Its wood is coarse grained and liable to speedy decay; hence it is but little esteemed for its timber. It has, however, a very thick bark, which will, no doubt, in time, be found of great value as a tanning material.

Among the shrubs of this region which deserve notice is *Arctostaphylos tomentosa*. This species is said to form quite a good sized tree at the north; but in the district at present under consideration it occurs only as a shrub, rarely attaining the height of fifteen feet and a diameter of from two to four inches at the base. It is a handsome evergreen bush, sending off numerous branches close to the ground. Its bark is smooth, of a reddish color, and splits off in transverse shreds. The wood, which is very close grained and durable, is an excellent material for small turning work. It bears a small red berry, resembling our well known "bear berry," though less astringent, which possesses acid properties, and, under the name of *Manzañita*, ("little apple,") is in common use as an ingredient of cooling drinks.

Another plant belonging to this region is *Cerasus ilicifolius* ("wild plum.") This is also an evergreen, and has thick pale green spinously serrate leaves. Its fruit, when mature, is of a yellowish pink color, with a pulpy external portion scarcely exceeding a line in thickness. Though the fruit has a pleasant taste, it would scarcely be considered worth eating in a country which was not, like this, almost destitute of wild fruits.

The scrub oaks growing here are all evergreen, with rigid coriaceous repandly toothed leaves, which are very variable in size and shape, even in the same individual. The fruit of all the species is of about the medium size and form, and is collected in large quantities by the Indians, who use it in preparing their favorite article of food, which they call "Atole."

Cercocarpus parvifolius is another characteristic plant of this region, and is remarkable for its long, spirally-tailed seeds. It is quite a handsome shrub, growing in clumps, and throws up wand-like branches to the height of five or ten feet. This is pretty exclusively confined to the higher elevations, and even reaches to the summit ridge.

We notice, also, as an inhabitant of these localities, *Frangula Californica*, Gray, (*Rhamnus*

tomentellus, Benth. Pl. Hartweg,) a species which appears to have a wide geographical range. Mr. Hartweg's specimens were collected among the mountains of the Sacramento valley, and we have seen others which were found by Dr. A. Randall near the head waters of the Gila river.

In the more southern portions of this district, and growing very abundantly in the vicinity of the boundary line, we find the pretty *Adenostoma sparsifolia*, (Torr. in Emory's report.) This grows more plentifully among the mountains than the already mentioned *A. fasciculata*, though the two agree closely in habit and are frequently found side by side. It grows in clumps, formed of numerous slender branches, and attains a height of four or eight feet. The upper part of each branch divides near the summit into a fine spray, clothed with yellowish green leaves, and, in the proper season, thickly set with small white flowers. The leaves and upper stems are covered with a glandular varnish, which exhales a pleasant aroma resembling that of *Aspidium fragrans*.

Other shrubs that may be noticed as characteristic of this region are the *Eriodyction Californicum* and *Chamæbatia foliolosa*, (Benth.;) the latter recently figured by Torrey in Plantæ Frémontianæ, in the Smithsonian Contributions. The shrubbery of this district is marked by a very intricate mode of growth, especially that upon the Coast Range of mountains. Here, so densely interwoven is the close mass of stunted bushes, that it is nearly impossible to force one's way either up or down the mountain sides.

This region furnishes a large variety of herbaceous plants. The greater number of those which, in the accompanying list, are referred to the "Mountains east of San Diego," have their localities in this district. Among the crevices of rocks grow several species of ferns, of the genera *Aspidium*, *Gymnogramma*, *Cryptogramma*, *Adiantum*, *Woodwardia*, &c. Mosses are rare, and but few lichens are observed; among the latter are the singular *Ramalina Menziesii*, Taylor, (*R. retiformis*, Menzies,) and species of *Parmelia*, *Roccella*, and *Evernia*.

THE PROPER MOUNTAIN REGION.

The immediate summit ridge, which is elevated to a height of from 3,000 to 5,000 feet above the sea, bears a rather meagre fringe of pines and other trees of the same family. This imparts a peculiar feature to the landscape, and recalls to mind the snows and wintry climate of high latitudes. Of the genus *Pinus* proper we find four species, some of them being dwarfed representatives of those forest monarchs which are so abundant and conspicuous further to the north.

In this region we encounter, though rarely, the majestic *Pinus Lambertiana*, with its enormous drooping cones. *P. Sabiniana* is more abundant. This species is remarkable for its singular fruit, each scale of which is tipped with a hard curved spine. The size and shape of this fruit are much like that of the pine apple.

Another species, *P. deflexa*, (Torr.,) has a trunk of elegant columnar form, and frequently attains to majestic proportions, even in these unfavorable situations. The fourth species is a *nut-pine*, and is described by Dr. Torrey in the accompanying enumeration as *Pinus Llaveana*.

This species is somewhat isolated in habit, and, as far as we have ascertained, has a very limited range near the dividing ridge and south of the boundary line. In the character of its fruit and foliage this species is closely allied to *Pinus monophylla*, (Torr.,) though quite dis-

tinct. It has a very compact, symmetrical form. The young individuals present a regularly oval mass of foliage, which, reaching the ground, completely conceals the stem and branches. Older plants attain a height of from 25 to 40 feet, and show a short trunk which supports a rounded head. This species bears an edible nut, which is collected by the Indians as an article of food.

Besides the pines, the other *Coniferæ* are *Abies Douglasii* and *Thuja occidentalis*.

We always find upland oaks associated with the pine growth of this region. These include the common *Quercus agrifolia* and *Q. densiflora*, the latter species being the more common upon the higher ridges. It is of stocky habit, and has wide-spreading branches, which form large spherical heads. The bark of this tree appears like that of the elm, and the wood is close-grained and durable.

There is another oak, which has deciduous leaves, the two preceding being evergreens. It seems to be closely allied to or identical with *Q. tinctoria*. Of this species there are two varieties which are only distinguishable by the fruit, which in one has a large and prominent gland, while in the other the gland is almost concealed by the cup—characters which seem to be constant in the same individuals.

The shrubbery of this region presents but little variety, and consists mostly of species which have been enumerated as belonging to the Lower Mountain district.

We naturally expect to find here the undergrowth which, in all countries, accompanies the pine forest. Here, indeed, grows the woodland strawberry, (*Fragaria vesca*,) while liliaceous plants are represented by *Cyclobothra alba;* we also meet with *Viola lobata*, a recently described species of Bentham. But of *Orchidaceæ*, so common elsewhere in such localities, we have only a solitary species of *Platanthera*. Cyrices are sparsely distributed, and *Potentilla*, so common in northern latitudes, has a place in our catalogue. The well-watered valleys are covered with a fine sward of native grasses, and lichens of sparkling yellow decorate the decaying pines.

VEGETATION OF THE EASTERN SLOPE OF THE MOUNTAINS, THE DESERT, AND THE BASIN OF THE COLORADO.

The features which vegetation presents, within the limits of this section, may be best described by noticing those which would naturally attract the attention of the traveller. The vegetation of the summit ridge differs but little upon its eastern and western side; but as we go further down the abrupt eastern descent a new group of plants comes into view, one which presents a marked contrast to that occupying the corresponding Lower Mountain region of the Pacific side. Here thorny shrubs and stiff-stalked plants of strange aspect meet the eye. The ashen colored mountains, which in the distance seem entirely destitute of vegetation, produce in their rocky cañons and crevices a great variety of singular forms. Cacti again appear, and, except in one or two instances, are all different from those found on the Pacific slope. There are several *Opuntias*, both those with cylindrical and those with elliptical stems. The gigantic *Echinocactus cylindraceus* lifts its bristling trunk from the clefts of the rock, and the humbler mamillaries are also met with. A new species of *Cereus* (*C. Engelmannii*) grows in these localities, and bears a deliciously palatable fruit.

On the upland plains, near the edge of the desert, we find a beautiful shrub with willow-like foliage and trumpet-shaped flowers. This showy plant is *Chilopsis linearis*. Here we also encounter a species of *Krameria*, having long and spiny branches and deep purple flowers, and

new *Rhumnaceous* shrub (*Zizyphus Parryi*, Torr.) makes its appearance. Upon the hill sides here grows a species of *Agave*, the "Mezcal" of this region. The root of this, when prepared by a kind of underground roasting, serves as an important article of food for the Indians. Here we also find the "Spanish Bayonet," a species of *yucca*, which presents its spine-armed leaves to the traveller. As we proceed, the lower valleys assume a complete desert-like character. The "creosote bush" (*Larrea Mexicana*) makes its first appearance, to be our constant companion for the remainder of the journey. Perhaps the most striking plant of these wastes is the *Fouquieria splendens*. This grows in clumps, consisting of from twelve to twenty long wand-like branches, which, springing from the main stem close to the ground, rise to the height of from ten to fifteen feet; the stems are beset with rows of spines, from the axils of which grow small fassicles of leaves. Its bright scarlet flowers only appear at the time when the stalk is destitute of leaves, and hence the whole plant has too naked an appearance to exhibit much beauty.

The well-known mezquite, (*Algarobia glandulosa*,) which we shall notice more particularly hereafter, now becomes a common shrub; and near the base of the mountains a species of palmetto is seen growing in the clefts of the rocks. Its appearance in these localities invariably indicates the presence of water, though this is frequently found to be too saline for use.

As we advance upon the desert plain a very distinct character of vegetation presents itself. On all the gravelly ridges near the mountains we find the stiff stalks of *Fouquieria*. In the furrowed rain-water courses there is usually a growth of shrubbery larger than in other portions of the desert. In such situations a small tree of graceful outline occurs—the *Dalea spinescens*, (Gray, Pl. Thurb.) The finely divided branches of this plant are all terminated by sharp points, and are covered with a silvery pubescence. It bears a few abortive leaves, and an abundance of bright blue flowers. Further on in the desert the vegetation is chiefly composed of *Larrea mexicana* and *Obione canescens*. Near the borders of the lakes and gullies which mark the position of "New river" we find a greater variety among the plants. A very rank growth of a species of *Amaranthus* borders the lakes in wet seasons, and on the upper clay borders of "New river." The annual "Gramma grass" yields, after the rains or the overflows of the rivers, a rapid growth of evanescent but highly nutritious fodder. We find in these situations a species of *Boerhavia* and one of *Kallstroemia*. The mezquite trees near these places attain a considerable size, and frequently bear upon their branches a vigorous growth of a peculiar misletoe.

As we descend from the table land of the desert, by the steep bluff which bounds the alluvial bottoms of the Colorado river, the vegetation consists almost entirely of dense thickets of mezquite, but it assumes a more varied character when we reach the alluvial tracts. On all places liable to overflow the cotton-wood and willow abound, the latter forming a thicket along the immediate margin of the river. The higher grounds near the river seem especially favorable for the mezquite, and we find it growing with greater luxuriance than we have seen it elsewhere. In some situations it forms thorny and impervious thickets, but it is usually sufficiently scattered to permit an easy passage for man or beast. The irregular growth of this tree renders it unfit for most of the uses for which timber is needed. As an article of fuel it is scarcely inferior to hickory, and the wood is very durable. The fruit of the mezquite is of the greatest value to the traveller in these regions. It is a long bean-shaped pod, which is greedily devoured by cattle and is found to be highly nutritious. A gum exudes from this tree which closely resembles gum arabic in its chemical characters. The production of the gum is evidently increased by

incisions made at certain seasons of the year, and especially by the proximity of fire; facts which may be turned to account if the gum should ever be collected as an article of commerce. Growing with the mezquite, though preferring a moister soil, is the *Strombocarpa pubescens*, or "screw bean," as it is called, on account of the twisted form of its pods. It is usually of small growth, and is rarer than the mezquite. The fruit is also used as food for animals, but is less valuable than that of the mezquite.

The principal undergrowth consists of *Tessaria borealis*, a shrubby composita, which grows upon light dry soil in thick masses. Its straight branches are from four to eight feet high; the younger portions of which, as well as the leaves, are covered with a silvery pubescence. In low saline places we find several chenopodiaceous plants; Salicornia, among others, which here becomes a stout shrub of two or three feet in height. These localities also furnish the singular *Dicoris*, a notice of which appears in Dr. Torrey's Appendix to Emory's Report.

A kind of soft cane grass (*Arundo Phragmites*) grows along the river's margin, and is the principal reliance for fodder in this region. Two other kinds of grasses are met with in similar situations, the seeds of which are collected for food by the Indians living near the river. One of these is a *Panicum*, the seeds resembling millet. The other has digitate spikes, resembling *Eleusine*. The flour made from the seeds of these wild grasses is husky, but quite palatable; and it may be remarked, that species of the genera from which it is derived are in common cultivation in the eastern hemisphere.

Many ravines occur on the eastern edge of the desert, by means of which its drainage reaches the valley of the Colorado; these furnish some of the most interesting plants in the district. Here we again encounter the silvery chapparal tree, before noticed, (*Dalea spinescens;*) also, another of the same natural family, *Olneya Tesota*, (Gray, Pl. Thurb.) This is a good sized tree, having much the habit of the common locust. Its fruit consists of short irregular pods, which contain two large orbicular seeds. The flowers were not seen. We also find here the tree frequently referred to in Major Emory's Report as the "green-barked acacia" of the valley of the Gila. This is *Cercidium floridanum;* and in these localities it is quite a large tree, resembling the weeping willow in habit. Its long drooping branches bear an abundance of pods.

Fouquieria grows upon all the gravelly hills, and the cactus family are represented by a slender, cylindrical, much branched, and horribly spinose *Opuntia*, (*O. ramosissima*, Engel. n. sp.)

Much yet remains to be learned respecting the vegetation of this singular region, especially that of the eastern base of the mountain range. Only enough is known at present to prompt the desire of a thorough botanical exploration of its floral riches.

On taking leave of this branch of our subject, we briefly notice a few general facts connected with the vegetation of the country under consideration. One of the most striking botanical characteristics of this region, and one which attracts the attention of the most casual observer, is the great preponderance of evergreen shrubs. This is not only true of the seacoast and desert, but also of the higher mountain ranges. This fact has an important bearing upon the aspect of the scenery, which would otherwise be desolate indeed in a country exposed to an uninterrupted drought of seven months duration in each year. Though the verdure has not the vivid freshness of spring, but is even inclined to a leaden hue, yet the relief to the eye will be readily appreciated when contrasted with those complete deserts, whose universal barrenness seems increased rather than relieved by the repulsive spine-clad cacti or bristling yuccas.

Another peculiarity is the general prevalence of a balsamic odor. This is especially true of

the most arid tracts, and serves to give a somewhat stimulating property to the atmosphere. This odor is due not only to the abundance of artemisias, but to a great variety of plants, especially those of the Labiate order, such as species of *Salvia* and *Audibertia*. Most of the *Compositæ* found here are more or less aromatic. In all cases the aroma seems to depend upon a resinous exudation, which probably performs the office of checking evaporation, by closing the pores of the leaves, and thus enables the vegetation of these arid tracts to survive the long continued dry season.

The effect of the peculiarities of the climate upon the vegetation of this region may be noticed here. The singular alternations of wet and dryness, heat and cold, produce a confused blending of seasons. Upon the immediate coast most of the annuals and those perennial plants having a succulent nature make their growth during the winter months, that being the season of rain.

In this latitude vegetable growth meets with but very little impediment from cold, as in these months the temperature rarely falls below the freezing point. When the November rains commence falling vegetation puts on its spring aspect, every barren hill is soon clothed in green, and by midwinter flowers are blooming in profusion everywhere, and many have even passed their brief season and have gone to seed. At this time the larger trees and deciduous shrubs drop their leaves, and only resume them at the close of the rainy season. This seeming exception to the general activity of vegetable life during the winter months is accounted for by the fact that the class of plants alluded to is almost exclusively confined to the margins of streams, hence their growth depends less upon moisture from the atmosphere. As dryness advances, during the months of May and June, all the evanescent forms are swept away, and the profusion of spring flowers gives place to the scanty products of the arid summer. Finally, these two yield to a still more sparse autumnal growth, which is mainly confined to the courses of streams. On the mountains, however, we find the alternation of seasons more like that of temperate climates. Here there is a winter sufficiently cold to prevent and a summer sufficiently moist to favor vegetable growth, which continues throughout the latter season. The scanty vegetation upon the eastern side of the mountains and along the Colorado is but partially watered by the uncertain showers of summer, and depends mainly upon the regular overflowing of the river. As the waters recede, the inundated places are speedily covered by a very rapid growth.

An enumeration of the plants observed, with precise and detailed accounts of the most interesting among them, will be found in the accompanying memoir by Professor John Torrey.

AGRICULTURAL CAPACITIES.

We will conclude this general sketch by briefly considering the agricultural capacities of the country, as indicated by its general geological features, its climate, and the natural botanical productions.

Commencing at the coast, we notice a prominent wall of high tertiary stuff abutting on the sea. This portion, which is thinly clad with verdure at any season, presents an uninviting aspect. Hence it happens that to the traveller who views it from the sea it is forbidding in the extreme. At a variable distance inland, however, where we find the line of settlements, the rounded hills are covered with a deep rich loam, which in the spring produces a luxuriant crop of wild oats. The river margins of this section are also of the same fertile character, and

support a rank vegetation. Along this belt, too, lie fruitful plains, which, when clothed with the pasturage of early spring, excite the admiration of the beholder.

As we approach the junction of the tertiary and the granitic exposures barrenness again prevails. The thin soil, which is here confined to the crevices of the rocks, produces a growth of shrubbery, the stunted character of which indicates its unproductive nature. Proceeding further inland, we find among the basin-shaped mountain valleys large trees and rich pasture grasses, denoting that a fertile soil again appears. This character, more or less varied by local causes, extends to the summit level.

Occasionally terraces are found upon the higher mountain slopes which possess a productive clay soil, well adapted to the growth of winter grains. In general, however, these localities are rugged and barren. From these facts it would appear that this country possesses a large share of fertile soil, but in estimating its agricultural capacities we must also take into consideration the peculiarities of the climate if we would arrive at correct conclusions. It is owing to the fact that this latter is not taken into account that such discrepancies occur in the statements of travellers, who, according to the season at which they view the country, pronounce it sometimes a desert and at others a garden. Let any one follow up the coast in the month of March, and pass over the verdant plains that stretch towards the sea; let him see every valley and hill clothed in the rich green of the wild oats, and every snow-fed stream running with clear water, and he will exclaim, "This is Arcadian land, the realization of the poet's song." But let him pass over the same region in the month of August or September, when nearly every green thing has disappeared, when, instead of soft breezes wafting over refreshing verdure, the heated air rises with a wavy tremor from the parching ground; let him visit the land when nothing remains of the streams but the dry beds, and the herds of cattle, which before were roaming at large in the enjoyment of the rich pasturage, are gathered in herds around the margins of the stagnant marshes, and the same traveller will pronounce the country to be a desert unfitted for the abode of man or beast.

Here, then, we have two widely differing extremes, between which lies the proper mean.

The true mode, then, of estimating how far this region is adapted to agriculture is to follow up the courses of the various streams which run towards the sea, and note the point at which the supply of water is constant, the width of the valley, and the nature of the soil at these places, and also whether the character of the surface will admit of irrigation. We then have the data for forming a just opinion as to the value of the land for husbandry. If the observations are made further inland, among the mountains, then the increase of elevation must be taken into account. The winter here brings snow, and the summer is shorter than it is near the sea level. Hence the length of the growing season is diminished, but while it continues growth is extremely vigorous, especially in the month of June. The abundant supply of water, wood, and the bracing mountain air, compensate for a frequently inclement winter, the difficulty of transportation, and a short summer season.

The founders of the early mission establishments in this region seem to have had a clear appreciation of these facts, and their locations were wisely selected, so as to embrace the widest extent of cultivable land, and the best situations for farms are still found to be in their vicinity. These missions occupy the valleys of the main water-courses, generally at that point where the supply of water can be depended upon in all seasons. Their aqueducts, bringing water from

towards the sources of the streams or from local springs, were often of great length and magnitude. The one belonging to the San Diego mission, for instance, is a continuous wall of masonry for the distance of nearly three miles. The upper portion of each valley was generally occupied by a branch dependency of the main mission, thus securing the entire control of the agricultural resources of the valley.

In regard to the eastern slope of the mountain but little additional need be said. In the immediate vicinity of the summit ridge arable land is found, but the more precipitous slope renders this too limited in extent to claim much attention. Desert valleys and pent up cañons succeed between this and the great plain. As far as all agricultural purposes are concerned this is truly a desert, though it is not, as is generally supposed, a mere waste of shifting sands, and destitute of every kind of vegetation.

We have already noticed that several shrubs are peculiar to this tract, which, if they serve no other purpose, at least afford relief to the eye.

The borders of "New River" being subject to frequent if not regular overflow, would seem to present some opportunities for the limited cultivation of maize, beans, pumpkins, and melons, such as is practiced by the Indians on the Colorado, and the existence of "gramma grass" on the higher adjoining ground would seem to indicate that quickly maturing cereals might be raised here.

The supply of water might, moreover, be rendered more constant and equable by the construction of artificial reservoirs and ditches. Still we must admit that any system of cultivation must be very precarious in a location where its success depends upon such variable causes.

The remarks respecting "New River" apply in a great measure to the Colorado. Here the cultivation is, of necessity, confined to those portions of the valley that are subject to overflow and the consequent deposition of fertilizing sediment. The higher adjoining lands, being without the reach of these influences, are, from their extreme aridity and the light porous nature of their soil, quite unfit for any cultivation.

All the Indian settlements upon the Colorado with which we are acquainted are located with reference to an overflowed portion of the river margin. Near the junction of the Gila with this river one Indian village occupies an old river bed, which, when the river is high, is completely covered by the stream. Another settlement is situated upon a low alluvial delta lying between the two rivers, and a third is built in a slough. These are also flooded at high water. The articles cultivated by these Indians are principally maize, beans, and pumpkins. No doubt that cotton, sugar, and many of the sub-tropical fruits would succeed here, but our present knowledge respecting the extent of arable soil, of the vicissitudes of the climate, and of the character of the different seasons, is too vague to warrant any but the merest conjecture in regard to its future agricultural importance.

UNITED STATES AND MEXICAN

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LIEUT. COL. W. H. EMORY,

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BOTANY

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BY

JOHN TORREY.

BOTANY.

RANUNCULACEÆ.

CLEMATIS RETICULATA, *Walt.* var.? foliis tenuioribus, etc., *Gray, Pl. Wright*, 2, *p.* 7. Valley of the Cibolo, Chihuahua; *Bigelow.*

CLEMATIS PITCHERI, *Torr. & Gray, Fl.* 1, *p.* 10. Hills of the Limpia and other places in western Texas; *Bigelow.*

CLEMATIS LIGUSTICÆFOLIA, *Nutt.; Gray, Pl. Fendl. p.* 3. Copper Mines, New Mexico; *Bigelow*, and westward to California; *Nuttall, Fitch.*

CLEMATIS LASIANTHA, *Nutt. in Torr. & Gray, l. c.* (TAB. I.) In various places, California, *Parry.* C. pauciflora, *Nutt.*, of which I have a specimen in fruit, kindly sent to me by that excellent botanist, appears to be a form of this species with smaller leaves and flowers than usual. Dr. Parry also found it at San Diego, but with male flowers only. Seemann refers C. lasiantha to C. Peruviana, *DC.*

CLEMATIS DRUMMONDII, *Torr. & Gray, l. c.* Along the tributaries of the Rio Grande, western Texas, and the Mexican States west of that river.

ATRAGENE ALPINA, *Linn. Sp. p.* 764. A. Ochotensis, *Pallas; Gray, Pl. Fendl. p.* 4. Sides of Ben Moore, near the Copper Mines of New Mexico; April; *Bigelow.*

THALICTRUM FENDLERI, *Engelm. in Pl. Fendl. p.* 5; *Gray, Pl. Wright, p.* 7; *Torr. Pl. Whipple, p.* 61. Copper Mines, New Mexico; *Bigelow*, Sierra del Pajarito, Sonora; *Schott*, Monterey. California; *Parry.*

ANEMONE CAROLINIANA, *Walt. Fl. Car. p.* On the upper Rio Grande, western Texas, and Chihuahua. Root an oblong black tuber.

MYOSURUS MINIMUS, *Linn. Sp. p.* Banks of streams, Chihuahua, April; *Bigelow.* On the lower Rio Colorado, Sonora; March; *Schott.*

RANUNCULUS TRACHYSPERMUS, *Engelm. & Gray, Pl. Lindh.* 1 *p.* 3. Prairies of western Texas; *Wright.* Sonora; *Schott.* The two varieties of Engelm. (l. c.) pass into each other.

RANUNCULUS AQUATILIS, var. DIVARICATUS, *Gray, Man. ed.* 2, *p.* 7. R. divaricatus, *Schrank; Gray, Pl. Wright*, 2, *p.* 8. On the Mimbres, New Mexico; May- July; *Bigelow, Thurber.*

RANUNCULUS CYMBALARIÆ, *Pursh; Torr. & Gray, Fl.* 1, *p.* 17. San Elcario, etc., on the Rio Grande; June; *Bigelow.*

RANUNCULUS AFFINIS, *R. Brown; Hook. Fl. Bor.-Amer.* 1, *p.* 12, *t.* 6. Copper Mines, New Mexico; June—August; *Bigelow.*

RANUNCULUS HYDROCHAROIDES, *Gray, Pl. Thurb. p.* 306. Wet meadows, Mababi, Sonora; *Thurber.*

RANUNCULUS MACRANTHUS, *Scheele in Linnæa*, 21, *p.* 585. R. repens, var. macranthus, *Gray, Pl. Lindh.* 2, *p.* 141, *& Pl. Wright*, 2, *p.* 8. Wet grassy places on the Limpia; June—July; *Bigelow.*

RANUNCULUS REPENS, var. MARILANDICUS, *Torr. & Gray, Fl.* 1, *p.* 31. Hills west of the Copper Mines, New Mexico; June; *Bigelow.*

RANUNCULUS CALIFORNICUS, *Benth. Pl. Hartw. p.* 295; *Torr. Pl. Whippl. in Pacific R. Road Expl. p.* 62. Monterey, and near San Francisco, California; March—May; *Thurber, Parry.*

RANUNCULUS HEBECARPUS, *Hook. & Arn. Bot. Beechey, p.* 369; *Torr. l. c.* R. parviflorus, *Torr. & Gr. Fl.* 1, *p.* 25, non *Linn.*

DELPHINIUM AZUREUM, *Michx. Fl.* 1, *p.* 314. On the upper Rio Grande, and westward to California; April—June.

DELPHINIUM CALIFORNICUM, *Torr. & Gray, Fl.* 1, *p.* 31. Monterey, California; May; *Parry.*

DELPHINIUM PATENS, *Benth. Pl. Hartw. p.* 296. In various parts of California, near the coast; *Parry, Thurber.*

DELPHINIUM MENZIESII, *DC. Syst.* 1, *p.* 355; *Lindl. Bot. Reg. t.* 1192. Near San Diego, etc., California; March; *Parry.*

DELPHINIUM DECORUM, *Fisch. & Mey. Ind. Sem.* (3) *Petrop. p.* 33. Monterey, California; May; *Parry.* Napa county, *Thurber.*

DELPHINIUM SCOPULORUM, *Gray, Pl. Wright,* 2, *p.* 9. Hills near the Copper Mines, New Mexico; *Bigelow.*

DELPHINIUM NUDICAULE, *Torr. & Gray, Fl.* 1, *p.* 33 & 661. Var. caule folioso. Napa county, California; March; *Thurber.*

DELPHINIUM CARDINALE, *Hook. Bot. Mag. t.* 4851. D. coccineum, *Torr. in Bot. Whipp. Rep. l. c. p.* 62. (TAB. III.) Mountains east of San Diego, California; *Parry.* This may prove to be a variety of the last species, but the lobes of the leaves are much longer, and taper to a narrow point. It is a splendid plant, with large scarlet flowers. Dr. Parry collected it in the year 1850, and I have distributed specimens of it under the MS. name quoted above. Our plate was engraved before the figure in the Botanical Magazine was published.

AQUILEGIA LEPTOCERA, var. FLAVA, *Gray, Pl. Wright,* 2, *p.* 9. Organ mountains, near Doña Ana, New Mexico, and on hills at the Copper Mines; April—July; *Parry, Bigelow.* Banks of rivers, Sonora; *Thurber, & Capt. E. K. Smith.*

AQUILEGIA CANADENSIS, *Linn.; Torr. & Gray, Fl.* 1, *p.* 29. β. *Torr. in Bot. Whipp. l. c. p.* 62. Ravines and hill sides, near Monterey, California; May; *Parry.*

PÆONIA BROWNII, *Dougl.; Bot. Reg.* 25, *t.* 30. Sides of hills above and below Sta. Barbara; also near San Luis Obispo, California, May; *Parry.* The carpels vary in number from 3 to 5.

MENISPERMACEÆ.

COCCULUS CAROLINUS, *DC. Syst.* 1, *p.* 524; *Gray, Gen. Ill.* 1, *t.* 28. Wet ravines, valley of the Pecos, and on the lower Rio Grande, Texas.

BERBERIDACEÆ.

BERBERIS (MAHONIA) AQUIFOLIUM, *Pursh, Fl.* 1, *p.* 219, *t.* 4, (*excl. fig.* 7.) Near Monterey, California; *Parry,* and on hills at the Copper Mines, New Mexico; *Bigelow.*

BERBERIS (TRIFOLIATA) FREMONTII; foliis 2—3-jugis, jugo ad basim petioli approximato, foliolis ovato-lanceolatis vel late ovatis repando-dentatis; dentibus spinescentibus; racemis paucis

erectis laxe 5—7-floris folium subaequantibus; pedicellis flore subduplo longioribus. B. trifoliata, *Torr. Bot. Whipp. p.* 63, *ex parte, non Moric.* Western Texas and New Mexico; *Bigelow, Thurber.* Cañon of the Guadaloupe river, Sonora; *Capt. E. K. Smith.* A handsome shrub 5—10 (rarely 15) feet high, Leaves coriaceous and rigid; leaflets 1—2¼ inches long, sometimes truncate or cordate at the base, the middle one usually much longer than the others, and with more numerous teeth; the lowest pair situated close to the base of the petiole. On some specimens the primary leaves are reduced to small branching prickles, as in Berberis proper. Racemes 1—3 together; the pedicels 4—5 lines long. Flowers about as large as in the common Barberry. Filaments inappendiculate. Berries somewhat ovate, dark blue, about the size of currants. This species was first discovered by Frémont, in 1844, on the tributaries of the Rio Virgen, in southern Utah. It is nearly allied to B. trifoliata, but differs in the number of leaflets, longer racemes, and blue berries.

BERBERIS TRIFOLIATA, *Moric. Pl. Nouv. Amer. p.* 113, *t.* 69; *Gray, Pl. Lindh.* 2, *p.* 142. Western Texas, and on hills near the Copper Mines, New Mexico; *Bigelow.* Westward to Chihuahua, Nuevo Leon, etc.; *Gregg, Thurber.* The bright red acid berries are used for tarts, and are less acute than those of B. vulgaris.

NYMPHAEACEÆ.

NUPHAR ADVENA, *Ait. Kew. ed.* 2, 3, *p.* 295. In water, Devil's river, western Texas; Sept. in fruit; *Bigelow.*

PAPAVERACEÆ.

ARGEMONE MEXICANA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 61. On the lower Rio Grande, Texas; *Schott.* Westward to California; *Parry.*

Var. HISPIDA A, hispida, *Gray, Pl. Fendl. p.* 5, Sonora; *Thurber.*

ARGEMONE FRUTICOSA, *Thurb. in Gray, Pl. Thurb. p.* 306. La Peña, Coahuila; *Thurber.*

MECONOPSIS HETEROPHYLLA, *Benth. in Lond. Hort. Trans.* (*ser.* 2) 1, *p.* 407; *Hook. Ic. t.* 733. Near the sea beach at San Diego, and at Santa Barbara, California; February; *Parry.* Our specimens are certainly annual.

ESCHSCHOLTZIA CALIFORNICA, *Cham.; Torr. & Gray, Fl.* 1, *p.* 664. Monterey, and various other parts of California; *Parry, Thurber.*

ESCHSCHOLTZIA DOUGLASII, *Hook. & Arn. Bot. Beechey, p.* 320. Ravines along the Rio Grande from Frontera to Eagle Pass; also in Chihuahua and Sonora; February—April.

PLATYSTEMON CALIFORNICUM, *Benth. l. c.; Lindl. Bot. Reg. t.* 1679; *Torr. & Gray, Fl.* 1, *p.* 65. Grassy places in various parts of California; *Parry, Thurber.* Most of the specimens belong to the variety *leiocarpum.* "Flowers ochroleucous, turning yellow in drying."

PLATYSTIGMA LINEARE, *Benth. l. c.; Hook. Ic. t.* 38; *Torr. & Gray, Fl. l. c.* Near San Luis Obispo, California; April; *Parry.*

MECONELLA CALIFORNICA, *Torr. & Frém. in Frém.* 2*d Rep. p.* Near San Francisco, California, on damp rocks; March; *Thurber.*

ROMNEYA COULTERI, *Harv. in Hook. Lond. Jour. Bot.* 4, *p.* 4, 74, *t.* 3. Borders of dry streams south of San Diego, California; *Parry.* A showy plant, with large white flowers, which, in some of the specimens, are 4½ inches in diameter. The mature capsules and seeds are not yet known.

DENDROMECON RIGIDUM, *Benth. l. c.; Hook. Ic. t.* 37; *Torr. & Gray, l. c.* (TAB. III.) In various parts of California, especially near the seacoast.

FUMARIACEÆ.

CORYDALIS AUREA, *Willd.* var. Siliquis breviusculis, etc., *Gray, Pl. Wright,* 2, *p.* 10. Dry ravines, Frontera; *Bigelow,* etc. Hueco mountains, Texas, March; *Thurber.*

DICENTRA? CHRYSANTHA, *Hook. & Arn. Bot. Beech. p.* 320, *t.* 73; *Torr. & Gray, Fl.* 1, *p.* 665. San Felipe, California; *Parry.* Between San Diego and the Rio Colorado; *Schott.* Monterey; *Mr. Andrews.* A tall branching plant, (3—4 feet high,) with showy golden yellow blossoms in panicles. It differs from Dicentra in the filaments of the two phalanges being united nearly to the summit, where alone they are distinct; in the dull verrucose horse-shoe-form seeds, which are thick on the margin, and destitute of a strophiole or crest; and, lastly, in a peculiar habit. The pollen is spherical, as in Dicentra. It may be considered as the type of a genus or subgenus, to which the name of Chrysocapnos would not be inappropriate.

CRUCIFERÆ.

CHEIRANTHUS ASPER, *Cham. & Schlecht. in Linnaea,* 1, *p.* 14, *excl. syn.* C. capitatus, *Dougl. in Hook. Fl. Bor. Amer.* 1, *p.* 38. Erysimum grandiflorum, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 96. Sandy hills near Monterey, California; May; *Parry.* The specimens are in flower and fruit. The siliques are an inch and three-quarters long, nearly two lines broad, and much compressed. Seeds narrowly winged, and sometimes partly in two rows. Cotyledons distinctly accumbent, although the radicle is, in some cases, slightly oblique. An original specimen of Nuttall's plant agrees exactly with ours, but it has only very young fruit. The ripe fruit and seeds have probably not been seen before.

ARABIS MACROCARPA. Turritis macrocarpa, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 75. Wet places, San Isabel, California; May; *Thurber.*

ARABIS PATULA. Turritis patula, *Graham; Gray, Pl. Fendl. p.* 7. Near the Mimbres, New Mexico; April; *Bigelow.* Sonora; *Parry.*

CARDAMINE ANGULATA, *Hook. Bot. Misc.* 1, *p.* 343, *t.* 69; *Torr. Bot. Whipp. Rep. p.* 65. C. paucisecta, *Benth. Pl. Hartw. p.* 297. California; *Parry.* The station not recorded, but probably Monterey.

DRYOPETELON RUNCINATUM, *Gray, Pl. Wright,* 2, *p.* 11, *t.* 11. Mountains of Chihuahua and Sonora; March—September; *Bigelow, Parry, Schott.* Hueco mountains, thirty miles east of El Paso, Texas; *Thurber.*

STREPTANTHUS LINEARIFOLIUS, *Gray, Pl. Fendl. p.* 7, *and Pl. Wright,* 1, *p.* 7; *and* 2, *p.* 10. Hills near the Copper Mines, June—August; *Bigelow.* Guadaloupe Cañon, Sonora; *Thurber.* Chihuahua; *Schott.*

STREPTANTHUS PLATYCARPUS, *Gray, Pl. Wright,* 2, *p.* 10. Mountain ravines, New Mexico; also, in western Texas and Chihuahua, along the Rio Grande, and west, to Sonora, March—April; *Bigelow, Parry.*

STREPTANTHUS CARINATUS, *Gray, l. c.* Ravines near El Paso; April. A showy species, and worthy of cultivation.

STREPTANTHUS PETIOLARIS, *Gray, Pl. Fendl. in not. p.* 7. Rocky hills, near the Limpia mountains, and Mountains of Muerte, etc.; July; *Bigelow.*

STREPTANTHUS LONGIFOLIUS, *Benth. Pl. Hartw. p.* 10; *Gray, Pl. Wright*, 2, *p.* 10. Rocky hills, western Texas, Near the Rio Grande, July; *Bigelow.*

STREPTANTHUS GLANDULOSUS, *Hook. Ic. t.* 40; *Torr. & Gray, Fl.* 1, *p.* 77. Napa county, California; *Thurber.*

STREPTANTHUS ARCUATUS, *Nutt. in Torr. & Gray, Fl. l. c.* Rocks on the seacoast, near San Francisco, California; April; *Thurber.*

NASTURTIUM PALUSTRE, *DC.; Gray, Pl. Wright*, 2, *p.* 10. Moist places, western New Mexico, Texas, and Chihuahua; April; *Bigelow, Thurber.* Variable in the length of the pods.

NASTURTIUM OBTUSUM, *Nutt. l. c.* Wet sandy places on the Rio Grande, from New Mexico to Eagle Pass; *Bigelow, Thurber.* Specimens from the lower Rio Grande have the pods nearly three-fourths of an inch long.

NASTURTIUM SESSILIFLORUM, *Nutt. l. c.* Brady's creek, Texas; *Thurber.*

NASTURTIUM CURVISILIQUA, *Nutt. l. c.* Napa county, California; *Thurber.*

BARBAREA VULGARIS, *Pr. Br.* var. pedicellis angulo recto patulis, *Benth. Pl. Hartw. p.* 297. On the Rio Mimbres, New Mexico; *Bigelow.* This resembles the California plant in the style.

THELYPODIUM WRIGHTII, *Gray, Pl. Wright*, 1, *p.* 3. Plains and low grassy places, Leon Springs, and along the Rio Grande, from forty miles below San Elceario to Eagle Pass; April—Sept.; *Bigelow, Schott.*

SISYMBRIUM CANESCENS, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 85. On the Rio Grande, from El Paso downward; also, in New Mexico; Febr.—May. Leaves often coarsely dissected.

SISYMBRIUM DIFFUSUM, *Gray, Pl. Wright*, 1, *p.* 8. Rocks near the Limpia, Texas; hills near the Copper Mines; and rocky places, Puerte de Paysano; July—Sept.; *Bigelow.*

ERYSIMUM ASPERUM, *DC.; Torr. & Gray, Fl.* 1. *p.* 95; *Torr. Bot. Whipple, Rep. p.* 66. Western Texas, Chihuahua, Sonora, and California. An extremely variable plant, which may be referred to several nominal species.

GREGGIA CAMPORUM, *Gray, Pl. Wright*, 1, *p.* 9, *t.* 1. Hills and prairies, on the Pecos and upper Rio Grande; also, in Chihuahua and Coahuila. The cauline leaves vary from entire to repandly toothed.

DRABA MICRANTHA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 109. El Paso, and near the Copper Mines, March—April; *Bigelow, Thurber.* Guadaloupe Pass and Santa Cruz, Sonora; *Parry.*

VESICARIA DENSIFLORA, *Gray, Pl. Lindh.* 2, *p.* 145. Eagle Pass, and other places on the lower Rio Grande; March; *Schott.*

VESICARIA ARGYREA, *Gray, l. c.* Near Corallitus, Chihuahua; *Thurber.*

VESICARIA STENOPHYLLA, *Gray, l. c. & Pl. Wright*, 2, *p.* 13. Hueco mountains, Texas; *Thurber.* El Paso and Mule Springs; March—April; *Bigelow.* All the forms described by Gray occur in the collections.

VESICARIA RECURVATA, *Engelm. in Gray, l. c. & Pl. Wright, l. c.* Banks of the Leon, Texas, April; *Thurber.* Tucson, and on the Gila, Sonora; March; *Parry.*

VESICARIA PURPUREA, *Gray, Pl. Wright*, 2, *p.* 14. Hueco mountains, in rocky places, El Paso and Cook's Springs; March—April; *Bigelow, Thurber.* Guadaloupe Pass, &c., Sonora; March; *Parry.* The petals are only slightly purple, often almost white, and yellowish toward the claw.

VESICARIA LASIOCARPA, *Hook.; Gray, l. c. p.* 13, *in not.* Elm creek, valley near the Rio Grande; *Schott.* Ringgold barracks; *Capt. E. K. Smith.*

DITHYRÆA WISLIZENI, *Engelm. in Wisliz. Mem. N. Mex. p.* 11; *Torr. in Sitgr. Rep. p.* 280, *t.* 11. Prairies and sandy banks, El Paso to the Copper Mines; *Bigelow, Thurber.* Overflowed banks of the Gila; March; *Parry.*

DITHYRÆA CALIFORNICA, *Harv. in Hook. Lond. Jour. Bot.* 4, *p.* 77, *t.* 5; *Englm. l. c.* Dry river beds of the Colorado, California; *Schott.*

THLASPI FENDLERI, *Gray, Pl. Wright,* 2, *p.* 15. Organ mountains and Copper Mines, New Mexico; April—May; *Bigelow, Thurber.* Guadaloupe Pass and Tubac, Sonora; February—March; *Parry.* The radical and lower cauline leaves are often denticulate.

SYNTHLIPSIS GREGGII, *Gray, Pl. Fendl. p.* 116, *in not.* Hill-sides on the lower Rio Grande; common near Eagle Pass; March—September; *Schott.*[1]

HYMENOLOBUS PUBENS, *Gray, Pl. Wright,* 1, *p.* 9. Wet places near Rock creek; July; *Bigelow, Parry.*

LEPIDIUM ALYSSOIDES, *Gray, Pl. Fendl. p.* 10. Chihuahua and on the Pecos; *Thurber.* Low grounds near El Paso, and on the Organ mountains; May—October; *Bigelow.* Valley of the Gila; *Schott.* Santa Cruz valley, Sonora; *Thurber.* The late secondary leaves on specimens from the Organ mountains are deeply pinnatifid, and the segments toothed.

LEPIDIUM WRIGHTII, *Gray, Pl. Wright,* 2, *p.* 15. Ravines near El Paso and at the Copper Mines; March—April.

LEPIDIUM INTERMEDIUM, *Gray, l. c.* Ravines, Organ mountains; April; *Bigelow.*

LEPIDIUM LATIPES, *Hook. Ic.* 1, *t.* 41; *Torr. & Gray,* 1, *p.* 116. Mission of San Luis Rey, California; *Parry.*

LEPIDIUM NITIDUM, *Nutt. in Torr. & Gray, l. c.* With the last; *Parry.* San Isabel, California; February; *Thurber.*

LEPIDIUM CALIFORNICUM, *Nutt. l. c.;* var. foliis bipinnatifidis; siliculis majoribus margine hispidis. With the last, and in the interior of the country as far east as the mountains.

[1] The following note is kindly furnished by my friend, Dr. Gray:

"SYNTHLIPSIS GREGGII, (*Gray:*) canescens vel subcinerea; foliis obovatis oblongisve sub obatis vel sinuato-pinnatifidis plerisque petiolatis roseis albisve; siliculis ellipticis (nunc ovalibus) complanatis insigniter emarginatis, valvis dorso acutissimus apice marginato-subproductis. San Fernando, Coahuila; *Berlandier,* (No. 822, 2231 & 2242.) Berlandier's specimens, though green or glabrate, only the young parts being at all hoary, and the leaves larger and rounder, yet apparently belong to the same species as Dr. Gregg's plant, on which this genus was founded The silicles vary from four to seven lines in length, are oblong-elliptical, or sometimes broadly oval, with a pretty strong emargination at the apex, strongly ob-compressed, and with an acute margin. The root is probably only biennial. The specific character here given is to distinguish this species from the following:

"SYNTHLIPSIS BERLANDIERI, (sp. nov.): puberula; foliis oblongis pinnatifido-laciniatis, caulinis sessilibus; petalis luteis; siliculis orbiculatis subretusis, valvis ad apicem haud productis. Matamoras; March and April; *Berlandier,* (No. 710, 778, 1517, 2127, 2198, 3017, 3102.) Root apparently only biennial. Stems diffuse or decumbent, about a foot in length, puberulent, as is the foliage, &c., with a minute and inconspicuous stellular down. Leaves an inch or less in length, 3-6 lines wide, laciniately pinnatifid and toothed. Racemes elongated in fruit, secund; the pedicels four to eight lines long, recurved in fruit; style about the length of the canescent ob-compressed ovary. Silicle three lines in length and breadth, slightly retuse at both ends, or at least at the apex, tipped with a slender style of a line in length; the valves strongly navicular, barely acute on the back, which is not produced into a margin at the apex. Seeds eight to ten in each cell, orbicular, flat, marginless, on filiform free funiculi. This plant in flower might be taken for one of the glabrate species of Vesicaria, but its silicles, strongly flattened contrary to the narrow partition, and the position of the seeds, exclude it from that genus, and from the tribe of Alyssineæ; and manifestly refer it to Synthlipsis, with which it accords in habit."—(*A. Gray.*)

CAPSELLA BURSA-PASTORIS, *Moench; DC. Syst.* 2, *p.* 283. San Luis Rey, California. Doubtless an introduced plant.

HYMENOLOBUS DIVARICATUS, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 117. California; *Parry.* The station not recorded; probably San Diego.

THYSANOCARPUS ELEGANS, *Fisch. & Mey. Ind. Sem. Hort. Petrop.* (1835) *p.* 50; *Torr. & Gray, Fl.* 1, *p.* 118, (var. γ.) Dana's Ranch, California; *Parry.* Napa, March; *Thurber.* Tucson, Sonora; *Parry.* The last is the most eastern station known of a species of this genus.

THYSANOCARPUS CRENATUS, *Nutt. in Torr. & Gray, l. c.* Santa Ana, California, March; *Parry.* Napa; *Thurber.*

THYSANOCARPUS LACINIATUS, *Nutt. l. c.* With the last. A more slender form than Nuttall's plant.

RHAPHANUS RAPHANISTRUM, *Linn.; DC. Prodr.* 1, *p.* 229. Naturalized abundantly on the lower Rio Grande and in the adjoining Mexican States.

CAPPARIDACEÆ.

CLEOMELLA ANGUSTIFOLIA, *Torr. in Gray, Pl. Wright,* 1, *p.* 11, *in not.* Gravelly places near Presidio del Norte, September; *Bigelow.*

CLEOMELLA LONGIPES, *Torr. l. c.* Saline plains, Sonora, June; *Thurber; Capt. E. K. Smith.*

CLEOME SONORÆ, *Gray, Pl. Wright,* 2, *p.* 16. With the last; *Thurber.* Near the Mimbres, New Mexico; *Bigelow.*

CRISTATELLA TAMESII, *Torr. & Gray, Fl.* 1, *p.* 123; *Gray, Gen. Ill.* 1, *p.* 177, *t.* 77. Between Victoria and San Antonio, Texas, October; *Schott.*

POLANISIA UNIGLANDULOSA, *DC. Prodr.* 1, *p.* 242; *Gray, Pl. Wright, p.* 10. Sandy places on the Rio Grande; also on Cibolo creek and near the Copper Mines; April—July. Variable in the size of the flowers. Seeds smooth and rough, often in the same specimen.

WISLIZENIA REFRACTA, *Engelm. in Wisliz. Mem. N. Mex. p.* 99; *Gray, l. c.* Alluvial soils near El Paso, May; *Parry, Bigelow.* Valley of the Gila; June; *Schott.* Sonora; *Thurber.*

ISOMERIS ARBOREA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 124.—(Tab. IV.) San Diego, California; May; *Parry, Thurber.* This interesting and handsome shrub deserves a place in our gardens.

RESEDACEÆ.

OLIGOMERIS GLAUCESCENS, *Cambess.*; *Gray, Pl. Wright,* 2, *p.* 16. Common along the Rio Grande, also in Chihuahua and on the Gila.

VIOLACEÆ.

VIOLA ADUNCA, *Smith in Rees Cyclop*; *Torr. Bot. Whippl. Rep. p.* 68. V. longipes, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 140. Near Monterey, California; April; *Parry.* Plains near the seacoast, San Francisco; *Thurber.* A form resembling Hartweg's No. 1660.

VIOLA OCELLATA, *Torr. & Gray, l. c.* New Almaden, California; April; *Thurber.*

VIOLA PEDUNCULATA, *Torr. & Gray, l. c.* San Luis Obispo; April; *Parry;* and San Diego to San Isabel, California; February; *Thurber.*

VIOLA LOBATA, *Benth. Pl. Hartw. p.* 298; *Torr. Bot. Whippl. Rep. p.* 68. Summit of the mountains east of San Diego, June; *Parry.* The leaves vary greatly. On the same specimen some of them are but slightly lobed, others are cut nearly to the base.

VIOLA CUCULLATA, *Ait.*; *Torr. & Gray, Fl.* 1, 139. Wet places near the Copper Mines and river Mimbres, New Mexico; April; *Bigelow, Thurber.*

IONIDIUM LINEARE, *Torr.*; *Gray, Gen. Ill.* 1, *p.* 189, *t.* 82. New Mexico and western Texas; west to Chihuahua and Sonora. It varies with the leaves broadly and narrowly linear, and from entire to acutely denticulate.

CISTACEÆ.

HELIANTHEMUM SCOPARIUM, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 152; *Benth. Pl. Hartw. p.* 299. Monterey and San Luis Rey, California; March—May; *Parry.*

HELIANTHEMUM CAROLINIANUM, *Michx. Fl.* 1, *p.* 307. Western Texas, August; *Wright.*

HYPERICACEÆ.

HYPERICUM FORMOSUM, *H. B. K. Nov. Gen. & Sp.* 5, *p.* 196, *t.* 160; *Gray, Pl. Wright,* 2, *p.* 17. Wet places near the Copper Mines, New Mexico; June—July; *Bigelow.* Santa Cruz, Sonora; *Thurber.*

HYPERICUM SCOULERI, *Hook. Fl. Bor. Am.* 1, *p.* 111. Mountains east of San Diego, California; June; *Parry.*

ELATINE AMERICANA, *Nutt.; Gray, Gen. Ill.* 2, *p.* 220, *t.* 95. Hills near the Copper Mines, New Mexico; *Bigelow.*

FRANKENIACEÆ.

FRANKENIA GRANDIFOLIA, *Cham. & Schlecht. in Linnaea* 1, *p.* 35; *Torr. & Gray, Fl.* 1, *p.* 168. Salt marshes and along the seashore near San Diego, California; June; *Parry.* Alluvions of the Rio Gila, Sonora; *Schott.* In Mr. Schott's specimens the leaves are much narrower than in those from the sea-coast.

CARYOPHYLLACEÆ.

SILENE ANTIRRHINA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 191. Western Texas; New Mexico and westward to Sonora and California.

SILENE PULCHRA, *Torr. & Gray, Fl.* 1, *p.* 675. Eastern slope of the mountains east of San Diego; *Parry.*

SILENE QUINQUEVULNERA, *Linn.; Torr & Gray, l. c.* Near Monterey, California; May; *Parry.* Probably introduced.

SILENE GREGGII, *Gray, Pl. Wright,* 2, *p.* 17. Ravine at the Copper Mines, New Mexico; August; *Thurber.*

ARENARIA BENTHAMII, *Fenzl.; Torr. & Gray, Fl.* 1, *p.* 675. Blanco river, Texas; *Wright;* and San Antonio, in the same State; *Thurber.*

ARENARIA DIFFUSA, *Ell. Sk.* 1, *p.* 519; *Gray, Pl. Wright,* 2, *p.* 18. Painted Camp; *Bigelow.*

ALSINE TENELLA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 179. A. tenuifolia, B. americana, *Fenzl. in Ann. Wien. Mus.* Monterey, California, May; *Parry.* Differs from A. tenuifolia in the less pointed sepals and in the seeds, which are 4 to 5 times larger, as well as more compressed, and marked with minute radiating rugæ.

ALSINE DOUGLASII, *Fenzl.; Torr. & Gray, Fl.* 1, *p.* 674. San Diego and Benicia, California; *Thurber.*

STELLARIA NITENS, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 185. S. moenchioides, *Fenzl. l. c.* Grassy, moist places near San Diego; *Parry.* The flowers in our specimens are all apetalous.

STELLARIA MEDIA, *J. E. Smith, Engl. Bot. t.* 537. Santa Barbara and other parts of California; introduced from Europe.

PARONYCHIA RAMOSISSIMA, *DC. Mem. Paronych. p.* 12, *t.* 4; *Torr. & Gray, Fl.* 1, *p.* 72. San Luis Rey, San Diego, &c.; *Parry, Thurber.* The large, imbricated, scarious stipules give this plant a silvery appearance. There are commonly 5 stamens, with as many intermediate oblong scales which are about the length of the filaments.

PARONYCHIA JAMESII, *Torr. & Gray, Fl.* 1, *p.* 170; *Gray, Pl. Wright,* 1, *p.* 13. Ravines, Rock creek; July; *Bigelow.* Ojo de Vaca, Chihuahua; *Thurber.*

PARONYCHIA LINDHEIMERI, *Engelm. in Gray, Pl. Lindh.* 2, *p.* 152. Middle and western Texas. Near the last species.

SPERGULARIA RUBRA, *Pers. Syn.* 1, *p.* 504; *Gray, Gen. Ill.* 2, *p.* 25, *t.* 107. Banks of the Rio Grande and seacoast of California.

DRYMARIA GLANDULOSA, *Bartl.; Gray, Pl. Wright,* 2, *p.* 18. Hills and rocky places, Copper Mines, New Mexico; August—October; *Bigelow.*

DRYMARIA FRANKENIOIDES, *H. B. K.; DC. Prodr.* 1, *p.* 395. Plains near the city of Chihuahua; October; *Thurber.* Arroyo near the Rio Grande, in Chihuahua; *Parry.*

DRYMARIA SPERGULARIOIDES, *Gray, Pl. Fendl. p.* 11. Ravines and low places near Lascuta; July; and near the Copper Mines; August; *Bigelow.*

DRYMARIA EFFUSA, *Gray, Pl. Wright,* 2, *p.* 19. Hills near Santa Cruz, Sonora; September; *Thurber.*

PORTULACACEÆ.

CALANDRINIA MENZIESII, *Hook. Fl. Bor. Am.* 1, *p.* 223, *t.* 70. Grassy places near San Diego, March; *Parry.*

CALANDRINIA MARITIMA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 197. On the Coronados islands, on the coast of California; May; *Thurber.*

TRIANTHEMA MONOGYNA, *Linn.; DC. Prodr.* 3, *p.* 352. Plains of the Limpia, Texas; July; *Bigelow.* Magdalena and Sierra Verde; *Thurber, Schott.*

TALINUM AURANTIACUM, *Englm. in Pl. Lindh.* 2, *p.* 154 & β. ANGUSTISSIMUM, *in Gray, Pl. Wright,* 1, *p.* 14. Gravelly hills near Rock creek and Van Horn's Wells, Texas; *Bigelow.* Sandy places, Sonora; *Schott, Thurber.*

TALINUM PARVIFLORUM, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 197. Stony hills at the Copper Mines and El Paso, New Mexico; also in Western Texas; *Bigelow, Thurber.*

TALINUM REFLEXUM, *Cav. Gray, Pl. Wright,* 2, *p.* 20. Dry prairies and hill-sides, San Pedro river up to the Pecos, and along the Rio Grande from El Paso to Presidio del Norte; June—October.

TALINOPSIS FRUCTESCENS, *Gray, Pl. Wright,* 1, *p.* 15, *t.* 3. Gravelly hills along the Rio Grande, from El Paso downward to the mouth of Great Cañon; also on the Cibolo; June—August; *Parry, Bigelow.*

SPRAGNEA UMBELLATA, *Torr. Pl. Frémont, in Smithson. Contrib.* 6, *p.* 4, *t.* 1. Damp rocks, Napa county, California; *Thurber.*

CLAYTONIA PERFOLIATA, *Donn; Torr. Gray, Fl.* 1, *p.* 199; *Torr. in Bot. Whippl. Rep. p.* 70. Monterey, California; *Parry.* Var. PARVIFLORA, *Torr. l. c.* Napa county, California; *Thurber.*

CLAYTONIA VIRGINICA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 198. Ojo San Francisco; February; *Parry.*

SESUVIUM PORTULACASTRUM, *Linn.; DC. Prodr.* 3, *p.* 352. On the Rio Grande, from Doña Ana, New Mexico, to the Gulf; April—October. Common along the Gila; *Thurber.*

PORTULACA PILOSA, *Linn.; Engelm. in Gray, Pl. Lindh.* 2, *p.* 154; *Pl. Wright,* 1, *p.* 13. Howard's Springs and dry ravines near the Limpio mountains; July—August; also near the Copper Mines; *Bigelow.*

PORTULACA LANCEOLATA, *Engelm. l. c.* Rocky places, Mule Springs, and Puerte de Paysano; August—September; *Bigelow.*

MALVACEÆ.

MALVA BOREALIS, *Walm; Gray, Pl. Fendl. p.* 15. Monterey, California; *Parry.*

MALVASTRUM AMERICANUM. Malva Americana, *L. Sp. p.* 968, (non *Cavan.,*) *DC. Prodr.* 1, *p.* 430. On the lower Rio Grande; *Schott.* Rugel collected this species on Key West, Florida. (No. 89; *Shuttleworth.*)

MALVASTRUM MONROANUM, *Gray, Pl. Fendl. p.* 21. Malva monroana, *Dougl. in Bot. Reg. t.* 1306. M. fasciculata, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 225. Near San Diego, California; *Parry.*

MALVASTRUM THURBERI, *Gray, Pl. Thurb. p.* 307. Santa Cruz valley, Sonora; July; *Thurber.* I can find no sufficient characters for distinguishing this from M. Monroanum.

MALVASTRUM COCCINEUM, *Gray, Pl. Fendl. p.* 24. Gravelly and sandy plains on the Limpia, Rock creek, and Rio Grande; also in New Mexico, Chihuahua, and on the Gila.

MALVASTRUM PEDATIFIDUM, *Gray, Pl. Wright,* 1, *p.* 17. Frontera, Texas; March; *Bigelow, Parry.*

MALVASTRUM LEPTOPHYLLUM, *Gray, Pl. Wright,* 1, *p.* 17. Ojo de Vaca, &c. Chihuahua; *Thurber.* Our specimens are smoother than Wright's plant.

CALLIRHOË INVOLUCRATA, *Gray, Pl. Fendl. p.* 15, *Gen. Ill. t.* 117. Moist grounds, valley of the Pecos, and between Eagle Pass and Laredo, Texas. March—April; *Schott.*

SIDALCEA HUMILIS, *Gray, l. c. p.* 23. Sida malvæflora, *Hook. & Arn. Bot. Beechey, p.* 326, non *Lindl.* Monterey and near Santa Barbara, California; *Parry.* San Diego, *Thurber.*

SIDALCEA MALVÆFLORA, *Gray, Pl. Wright,* 1, *p.* 16. Sida malvæflora, *Mog. & Sesse. DC. Prodr.* 1, *p.* 194. Marshes of the Limpia and hills at the Copper Mines; July; *Bigelow.* Ojo de Gavilan and Rio Mimbres; *Thurber.* El Podrero, Sonora; June; *Schott.* It sometimes occurs with white flowers.

SIDA HEDERACEA, *Torr. in Gray, Pl. Fendl. p.* 23, *ad not.* New Mexico, on the upper Rio Grande, Sonora, and California; northward to Oregon.

SIDA FILICAULIS, *Torr. & Gray, Fl.* 1, *p.* —. Rocky and gravelly hills, Howard Springs, and between Van Horn's Wells and Muerte; *Bigelow.*

SIDA FILICAULIS, var. SETOSA, *Gray, Pl. Wright,* 2, *p.* 22. Rock creek and near the Great Cañon of the Rio Grande; *Bigelow, Parry.*

SIDA FILIPES, *Gray, Pl. Wright,* 2, *p.* 19. Crevices of rocks and ravines between the Pecos and San Pedro; *Schott.* El Paso; *Bigelow.*

SIDA LEPIDOTA, *Gray, l. c. p.* 18. Plains near Leon Springs; September; *Bigelow*. Cocospera, Sonora, and east of Sierra Madre; July—September; *Schott*.

SIDA PHYSOCALYX, *Gray, Pl. Lindh.* 2, *p.* 163. Hills between Van Horn's Wells and Muerte; May—July; *Bigelow*. Near Laredo; *Schott*. Fronteras, Sonora, and near the city of Parras, State of Coahuila; *Thurber*.

SIDA LONGIPES, *Gray, Pl. Wright*, 1, *p.* 31. San Pedro valley and on the Cibolo creek, also near Leon Springs; July—September; *Parry, Bigelow*.

SIDA ELLIOTTII, *Torr. & Gray, Fl.* 1, *p.* 232. Rocky places on the Limpio and at Van Horn's Wells, July; *Bigelow*. A dwarf form was found by *Thurber* at the Copper Mines.

ANODA HASTATA, *Cav.; Gray, Gen Ill.* 2, *t.* 124. Valley of the Cocospera, Sonora; September—October; *Schott*. Mount Carmel, near the Rio Grande, Chihuahua, November; *Parry*.

ANODA PENTASCHISTA, *Gray, Pl. Wright*, 2, *p.* 22. Zuñi mountains, August—September; *Bigelow*. Presidio del Norte and further down the Rio Grande; *Parry*. Sonora; *Thurber*.

ANODA WRIGHTII, *Gray, Pl. Wright*, 2, *p.* 22. Dry ravines along the upper Rio Grande, also rocky places on the Limpia; *Bigelow*.

ABUTILON HOLOSERICEUM, *Scheele in Linnæa*, 21, *p.* 471. Rocky hills between Painted Camp and Wild Rose Pass, also on Turkey creek; July—November; *Bigelow*.

ABUTILON TEXENSE, *Torr. & Gray, Fl.* 1, *p.* 231; *Gray, Pl. Wright*. Rocky hills on the Cibolo and mountains of Muerte, &c.; July—August. Valley of the Cocospera and Magdalena, Sonora; *Schott, Thurber*.

ABUTILON CRISPUM, *Don.; Gray, Gen. Ill.* 2, *t.* 126. Bogenhardia crispa, "*Reichenb. Repert. Herb.* 200, *No.* 7636." Rocky hills and ravines along the Rio Grande and its tributaries. Bachimba, Chihuahua, and Magdalena, Sonora; *Thurber*. Specimens from the latter station have remarkably villous stems.

ABUTILON THURBERI, *Gray, Pl. Thurb. p.* 307. Shady places, Magdalena, Sonora; October; *Thurber*.

ABUTILON PARVULUM, *Gray, Pl. Wright*, 1, *p.* 21. Flounce mountains and rocky hills between Van Horn's Wells and Muerte; June—July; *Bigelow*.

WISSADULA MUCRONULATA, *Gray, Pl. Berland. ined.* On the Rio Grande, below Reynosa, October; *Schott*. Leaves cordate, entire, green, and smoothish above, paler and somewhat velvety underneath. Peduncles paniculately several-flowered, the flowers very small, with obovate petals. Carpels obovate, smoothish, with 2 short horns, 4—5 seeded.

SPHÆRALCEA ANGUSTIFOLIA, *Spach; Gray. Pl. Wright*, 1, *p.* 21. S. stellata, *Torr. & Gray, Fl.* 1, *p.* 228. Moist, alluvial soils. Western Texas; June. On the Fronteras, Sonora; June—November; *Thurber*, A broad-leaved form was found by Schott at Eagle Pass.

SPHÆRALCEA HASTATULA, *Gray, l. c. p.* 17. On the Rio Pecos; *Thurber*.

SPHÆRALCEA INCANA, *Torr. in Gray, Pl. Fendl. p.* 23; *Pl. Wright*, 1, *p.* 21. El Paso; *Parry;* and Laguna los Putos, Chihuahua; *Thurber*. San Elcearío, &c.; *Bigelow*. Var. DISSECTA, *Gray, l. c. p.* 21. Chihuahua; *Schott, Thurber*.

SPHÆRALCEA FENDLERI, *Gray, l. c.* Low grounds along the Gila; *Schott*. Santa Cruz, Sonora; *Thurber*.

PAVONIA WRIGHTII, *Gray, Gen. Ill.* 2, *p.* 76, *t.* 130; *Pl. Lindh.* 2, *p.* 161. Shady borders of the tributaries of the lower Rio Grande; *Schott, Bigelow*.

Malvaviscus Drummondii, *Torr. & Gray, Fl.* 1, *p.* 230; *Gray, Gen. Ill.* 2. *t.* 131. Southwestern and central Texas; *Thurber, Schott.* The baccate fruit is red when ripe.

Kosteletzkya (Orthopetalum) paniculata, *Benth. Pl. Hartw. p.* 285. Mountain pass near Cocospera river; September; *Schott.* Corolla, deep rose color. Bentham regards this plant as the type of a distinct section or, perhaps, genus, differing from Kosteletzkya in the erect convolute petals.

Hibiscus Coulteri, *Harvey in Gray, Pl. Wright,* 1, *p.* 23. Western Texas, near the Rio Grande; June—October.

Hibiscus denudatus, *Benth.* Var. involucellatus, *Gray, l. c. p.* 23. Gravelly table-lands of the Rio Grande, from El Paso down to the Cibolo; May—September; *Parry, Bigelow.*

Hibiscus cardiophyllus, *Gray, l. c. p.* 22. Dry limestone hills near the mouth of the Pecos; September—October; *Schott, Bigelow.*

Thurberia thespesioides, *Gray, Pl. Thurber, p.* 308. (Tab. VI.) Cañon near Cocospera and Ymuris, Sonora; October—November; *Schott.* Mr. Schott informs me that this plant is called *Algodoncello* by the Sonorians.

BYTTNERIACEÆ.

Melochia pyramidata, *Linn; Gray, Gen. Ill.* 2. *p.* 134 *and Pl. Lindh. p.* 165. Western Texas; *Schott, Bigelow.*

Melochia tomentosa, *Linn; DC. Prodr.* 1, *p.* 490. On the lower Rio Grande; *Schott.*

Waltheria detonsa, *Gray, Pl. Wright,* 2, *p.* 24. Magdalena, Sonora; *Thurber.*

Hermannia Texana, *Gray, Gen. Ill.* 2, *p.* 88. *t.* 135. Ravines of Devil's river and plains near Howard's Spring; also at the mouth of the Pecos; September—October; *Bigelow.*

Ayenia pusilla, *Linn; Gray, Pl. Wright.* 1, *p.* 24, 2, *p.* 24. Dry rocky ravines, Van Horn's Wells, June; *Parry;* Sonora; *Thurber.*

Ayenia microphylla, *Gray, l. c.* Rocky hills of the Rio Grande, near and below El Paso; *Parry, Bigelow.*

TILIACEÆ.

Corchorus pilolobus, *Link; Gray, Pl. Wright,* 2, *p.* 24. Gravelly beach of the Island of Lost Rocks, lower Rio Grande, September; *Schott.* Santa Rosa valley; *Parry.*

LINACEÆ.

Linum multicaule, *Hook. in Torr. & Gray, Fl.* 1, *p.* 698; *Engelm. in Gray, Pl. Wright,* 1. *p.* 27. Valley of the Limpio; July; *Bigelow.*

Linum Berlandieri, *Hook. Bot. Mag. t.* 3,480; *Engelm. l. c.* Live Oak creek and rocky places on the Rio Grande; also in Chihuahua.

Linum perenne, *Linn; Engelm. l. c.* Plains between the Limpia and the Rio Grande, and westward to the Gila.

Linum rigidum, *Pursh; Engelm. l. c.* Gravelly hills from El Paso to San Eleazario; April—June.

Linum rupestre, *Engelm. in Gray, Pl. Lindh.* 2, *p.* 232. Rocky places on the Limpia and Rio Grande.

OXALIDACEÆ.

OXALIS BERLANDIERI (n. sp.): caulescens, pilosa; foliis trifoliolatis, foliolis oblongis v. obovato-oblongis plerumque emarginatis terminali valde petiolulato; pedunculis axillaribus subterminalibusque 3—5-floris folium subæquantibus erectis; petalis flavis. Sandy places in the prairies between Laredo and Ringgold Barracks, June; *Schott.* Rio Nueces, *Berlandier*, No. 1094 and 2524. Stems arising from a slender subterranean rhizoma, erect, 4—6 inches high, branching towards the base. Lateral leaflets 3—4 lines, terminal 5—6 lines long. Filaments unequal, 5 of them hairy, twice as long as the alternate smooth ones. Cells of the ovary about 4-ovuled. Capsule subglobose-ovate, scarcely as long as the sepals, strongly 5-angled; the cells one-seeded. Seeds strongly tuberculose-ribbed. Allied to O. psoraleoides. The only species of this section hitherto found within the limits of our Flora.

OXALIS DICHONDRÆFOLIA, *Gray, Pl. Wright.* 1, *p.* 27. Sides of dry, calcareous hills near the lower Rio Grande; *Schott.* Plains of Los Muros; *Bigelow.*

OXALIS DRUMMONDII, *Gray, Pl. Wright.* 2, *p.* 25. O. vespertilionis, *Torr. & Gray, Fl.* 1, *p.* 679. Plains between the Leona and lower Rio Grande; also in Sonora, near the San Pedro river.

OXALIS VIOLACEA, *Linn.; Torr. & Gray, Pl.* 1, *p.* 211. Between the Pecos and Devil's river and the Rio Grande; Copper Mines, New Mexico; *Bigelow, Parry.* Usually taller than the eastern plant, but with smaller and more numerous flowers.

OXALIS WRIGHTII, *Gray, Pl. Wright.* 1, *p.* 27, & 2, *p.* 25. Near Rock Creek, and Presidio del Norte, July—August; *Bigelow.* Santa Cruz valley, Sonora; *Thurber.*

OXALIS DECAPHYLLA, *H. B. K.*; *Gray, l. c.* 2, *p.* 25. Copper Mines, New Mexico, August; *Bigelow.*

OXALIS STRICTA, *Linn.; Torr. Fl. N. York*, 1, *p.* 123. Rocks along the Leona and sandy banks of the lower Rio Grande, March—November.

GERANIACEÆ.

GERANIUM CAROLINIANUM, *Linn.; Torr. & Gray, Fl.* 1, *p.* 207. Central and western Texas; also in Chihuahua and various parts of California.

GERANIUM CÆSPITOSUM, *James; Gray, Pl. Fendl. p.* 25. Organ mountains; *Bigelow.* Hills at the Copper Mines, June—August; *Bigelow, Thurber.* "Flowers usually purple, but sometimes quite white." *Thurber.*

ERODIUM TEXANUM, *Gray, Gen. Ill.* 2, *t.* 151. Northern New Mexico, western Texas and borders of the Gila.

ERODIUM CICUTARIUM, *Herit.; DC. Prodr.* 1, *p.* 646. Common in New Mexico and throughout Sonora and California; probably introduced by the Spaniards.

ERODIUM MACROPHYLLUM, *Hook. & Arn. Bot. Beechey, p.* 327. California, (station not recorded,) *Parry.* The leaves in our specimens are much smaller than they are described by Hooker & Arnott, being scarcely more than an inch long.

LIMNANTHACEÆ.

LIMNANTHES DOUGLASII, *R. Br.; Torr. & Gray, Fl.* 1, *p.* 209, Benicia, California, March; *Thurber.*

ZYGOPHYLLACEÆ.

LARREA MEXICANA, *Moric.; Torr. in Emory's Rep., p.* 138, *t.* 3; *Gray, Gen. Ill. t.* 147. Along the boundary line from the Rio Grande to California.

PORLIERA ANGUSTIFOLIA, *Gray, Pl. Wright.* 2, *p.* 28. Guiacum angustifolium, *Engelm.* Plains near Eagle Pass, *Bigelow*, Deadman's Hole; *Parry.*

FAGONIA CALIFORNICA, *Benth. Bot. Sulph., p.* 10.; *Torr. in Pacif. R. R. Ex., Expe. pl.* 6, *p.* 359, *t.* 1. Rocky and hill sides of the lower Colorado, California, February; *Schott.*

GUIACUM COULTERI, *Gray, Pl. Thurb. p.* 312. Hills between Rayon and Ures, Sonora; *Thurber.*

KALLSTRŒMIA GRANDIFLORA, *Torr. in Gray, Pl. Wright.* 1, *p.* 26. Borders of the Rio Grande in western Texas; Chihuahua and Sonora, July. Mr. Schott states that it is called *Mal de Ojo* by the Sonorians.

KALLSTRŒMIA MAXIMA, *Torr. & Gray, Fl.* 1, *p.* 213. Common along the Rio Grande, and westward throughout the Mexican States and southern California.

RUTACEÆ.

KORBERLINIA SPINOSA, *Zucc.; Gray, Pl. Wright.* 1, *p.* 30, & 2, *p.* 26. Rich soils in various places along the Rio Grande and in the Mexican States westward, May—August. "In favorable situations this shrub sometimes attains the height of 8 or 10 feet." *Thurber.*

PEGANUM MEXICANUM. *Gray, l. c.* 1, *p.* 30, *adnot.* Low places near the Eagle mountains, June; *Bigelow.* El Gallo, Chihuahua, November; *Thurber.*

THAMNOSMA TEXANUM. Rutosma Texanum, *Gray, Gen. Ill.* 2, *p.* 114, *t.* 155. Hills between the Pecos and Devil's river and the Rio Grande; also along the latter river from El Paso downward, and in western New Mexico, Sonora, etc., flowering throughout the season.

THAMNOSMA MONTANUM, *Torr. & Frem. in Frem. 2d Rep., p.* 313. Sierra Tule, Sonora; *Schott.* San Felipe, California, May; *Thurber.*

ASTROPHYLLUM DUMOSUM, *Torr. in Bot. Pope's Report, p.* 161. Mountains about thirty-five miles below El Paso, in Chihuahua, July (in fruit); *Bigelow.* Borders of the Rio Mimbres, *Dr. Henry*, United States army. Western slope of the Sierra del Pajarito, Sonora, July, (just past flowering,) *Schott*, (not on the Rio Grande, as erroneously stated in the Botany of Captain Pope's Report.) Since the description quoted above was written, other specimens of this remarkable plant have been received, but none of them with perfect flowers. In one or two instances withered, imperfect flowers were found, and we can now give a nearly complete character of the genus, which rather belongs to the Diosmeæ than to the true Rutaceæ.

ASTROPHYLLUM.

Calyx 4—5-sepalus, deciduus; sepalis obtusis. Petala 4—5, obovata. Stamina 8—10. Ovarium sessile, disco hypogyno 8—10-lobo insidens, 4—5-lobum, 4—5-loculare; loculis

2-ovulatis. Styli tot quot carpella, coaliti, demum inferne distincti. Stigma capitatum, 4—5-lobatum. Capsulæ abortu sepius 2, basi subcoalitae, sessiles, semibivalvia. Semina plerumque solitaria subglobosa. Frutex humilis, graveolens, ramosissimus; foliis oppositis petiolatis, palmatim 5—10-foliolatis; floribus albis in axillis summis solitariis vel subumbellatis.

A shrub 3 to 6 feet high, with numerous pubescent, crowded, opposite branches. Leaves opposite, (rarely sub-opposite), pubescent, exstipulate; petioles, 6—10 lines long; leaflets mostly longer than the petioles, marked (as are also the petioles and younger branches) with prominent conspicuous glands. In all the specimens from the Rio Grande there are 6 to 10 leaflets, which are narrowly linear (scarcely a line wide), and sub-coriaceous; in those from Sonora there are 5, which are twice as broad, and thinner. These glands, on the leaflets, are somewhat distant and marginal. Flowers perfect. Pedicels 8—10 lines long, mostly near the extremity of the branches, either solitary or 2 to 4, and somewhat umbellate. Sepals 4—5, short and semiovate, ciliate on the margin. Petals inserted at the base of the shorter stamens, 3—4 times as long as the calyx, obovate, narrowed at the base. Stamens mostly 8; filaments naked, the alternate ones longer, compressed; anthers ovate, fixed by the base, opening longitudinally. Disk produced into 8—10, nearly equal glandular lobes, which are without pores. Ovary hairy, 4—5-lobed, 4—5-celled; the cells produced above into a short obtuse beak, exterior to the style; each cell containing 2 collateral hemitropous ovules. Styles short, at first combined, but afterwards (and especially in the unfructified ovaries) distinct below; stigma of 4—5 capitate lobes. Fruit capsular; only two of the carpels usually ripening; these are broadly ovate, compressed, dotted with brown impressed glands, mucronate with the base of the style; the beak, which in the ovary was at the summit of the carpel, becoming, in the mature fruit, a dorsal tooth. At maturity the carpels open nearly the whole length of the dorsal suture, and down the back as far as the tooth. The endocarp also separates almost entirely from the epicarp. Seeds mostly solitary in each cell, globose-ovate, black and shining. Embryo nearly straight in the axis of fleshy albumen; cotyledons roundish-ovate, flat, with a very short radicle. A very distinct genus.

PITAVIA (GASTROSTYLA) DUMOSA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 215. San Diego and San Pasqual, California, Febr.; Parry, *Thurber*. A shrub 2—3 feet high. Leaves pungent when chewed. Cymes 3-flowered, terminal, and on short lateral spurs. Calyx 4-parted; the segments ovate, acute, coriaceous. Petals white, equal, oblong, sparsely dotted. Stamens 8; filaments subulate; anthers somewhat reniform, innate, retrorse. Ovary solitary, seated on a fleshy sub-globose slightly lobed disk. Stigma capitate. Fruit 1—2-seeded, testa thick and coriaceous. Embryo curved, in rather thin fleshy albumen. This plant (as was remarked in the Flora of N. America) is hardly a congener of Pitavia. It may form a sub-genus, distinguished by its hermaphrodite flowers, solitary ovary, lateral style, and curved embryo.

ZANTHOXYLUM CAROLINIANUM, *Lam.; Torr. & Gray, Fl.* 1, *p.* 24. Var. foliis brevioribus ovatis, &c.; *Gray, Pl. Wright.* 1, *p.* 30. Head waters of the Nueces; also ravines on Devil's river and near Eagle Pass, Texas, March (in flower)—September (in fruit); *Bigelow.*

ZANTHOXYLUM PTEROTA. *H. B. Kth. Nov. Gen. & Sp.* 6, *p.* 3. Rocky places and hills near Santa Rosa, Cohahuila. February; *Bigelow.* Fort McIntosh, on the Rio Grande, May (fruit); *Schott.*

PTELEA TRIFOLIATA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 225, *and B. p.* 680. Rocky places, Fron-

tera, Texas, and on the Mimbres, New Mexico; *Bigelow.* It is usually a shrub of from 3 to 6 feet high, but it sometimes occurs twenty feet.

PTELEA ANGUSTIFOLIA, *Benth. Pl. Hartw. p.* 9; *Gray. Pl. Fendl. p.* 28. Limestone hills around Ringgold Barracks; *Schott.* Mountain ravines, El Paso; *Thurber.*

COCHLOSPERMEÆ.

AMOREUXIA SCHEIDIANA, *Planch. in Hook. Lond. Jour. Bot.* 6, *p.* 140, *t.* 1; *Gray, Pl. Wright.* 2, *p.* 26, *t.* 12, *A.* Santa Cruz valley, Sonora; *Thurber.*

AMOREUXIA WRIGHTII, *Gray, l. c.* A. Scheidiana, *Pl. Wright.* 1, *p.* 29, *t.* 3. *B. excl. syn.* In rich soil, Eagle Pass, June; *Schott.* Hills and plains near the mouth of the Pecos, October (fruit); *Bigelow.*

ANACARDIACEÆ.

RHUS VIRENS, *Lindh. in Gray, Pl. Lindh.* 2, *p.* 159; *Pl. Wright.* 1, *p.* 31. Limestone rocks on Devil's river, and at the mouth of the Pecos; *Bigelow.*

RHUS MICROPHYLLA, *Engelm. in Gray, Pl. Wright.* 1, *p.* 31. Ravines along the Rio Grande, from El Paso down to Eagle Pass; also in Chihuahua and Sonora.

RHUS TRILOBATA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 219; *Gray, Pl. Wright.* 1, *p.* 31. Northern New Mexico and the Valley of the Rio Grande; also in Sonora and California. A form with the leaves velvety-pubescent occurs at the Copper Mines and on the Organ mountains, New Mexico.

RHUS COPALLINA, var. LANCEOLATA, *Gray, Pl. Lindh.* 2, *p.* 158. Hills and rocky places between the Limpia and the Rio Grande, July; *Bigelow.*

RHUS TOXICODENDRON, *Linn.; Torr. & Gray, l. c.* A variety with narrow leaves was found on the Sierra del Pajarito, Sonora, by *Schott;* and at the cañon of Guadaloupe, by Capt. E. K. Smith.

RHUS DIVERSILOBA, *Torr. & Gray, l. c.* R. lobata, *Hook. Fl. Bor. Amer.* 1, *p.* 127, *t.* 46; *Lindl. Bot. Reg.* (*n. ser.*) 31, *t.* 38. In various parts of California; frequent.

PISTACIA MEXICANA, *H. B. K. Nov. Gen. & Sp.* 7, *p.* 22, *t.* 608. Rocky ravines near the mouth of the Pecos, western Texas, October (fruit); *Bigelow.* A small tree.

LITHRÆA LAURINA, *Walp. Repert.* 1, *p.* 550; *Torr. Pl. Whippl. l. c. p.* 73. Rhus (Malosma) laurina; *Nutt. in Torr. & Gray, Fl.* 1, *p.* 219. (TAB. VII.) San Diego, California; *Parry.*

STYPHONIA INTEGRIFOLIA, *Nutt. in Torr. & Gray, Fl. l. c. & Sylv.* 3, *p.* 4, *t.* 82; *Torr. in Pacif. R. Road Expl.* 7, *Bot. p.* 8, *t.* 2. Santa Barbara and San Diego, California; *Parry, Thurber.* Leaves very variable in size and outline, especially upon the young shoots. S. serrata (*Nutt.*) is not distinct.

SCHINUS MOLLE, *Linn. Sp. p.* 1467. Lower California, near the boundary line; *Parry;* and at the Mission of San Luis Rey; *Thurber.* It is common also in all the Mexican States, but is probably not indigenous. Mr. Thurber informs me that in California it is called Pepper Tree by the residents, the berries having precisely the taste of the common black pepper.

SIMARUBACEÆ.

CASTELA NICHOLSONI, *Hook. Bot. Misc.* 1, *p.* 271, *t.* 56; *Gray, Gen. Ill.* 2, *t.* 158. Dry plains and hills, western Texas, along the Rio Grande, February—March; *Parry, Thurber.* Mier Neuvo Leon; *Thurber.*

HOLACANTHA EMORYI, *Gray, Pl. Thurber. p.* 310. (TAB. VIII.) Near Sonoita, Sonora, August (with fine fruit); *Schott.* The description of this remarkable plant, by Dr. Gray, is so complete and so accurate that I have nothing to add but a good figure by Sprague.

VITACEÆ.

VITIS BIPINNATA, *Torr. & Gray, Fl.* 1, *p.* 243. Banks of Escondida creek, near Eagle Pass, and at Rock creek, western Texas, July—September (in fruit); *Bigelow.*

VITIS INCISA, *Nutt. in Torr. & Gray, l. c.* On the lower Rio Grande, and in Cocospera valley, Santa Magdalena, Sonora; *Schott.* "It is mixed with cochineal and used by the Mexicans to dye red."

VITIS ÆSTIVALIS, *Fl.* 2, *p.* 230; *Torr. & Gray, l. c.* Central Texas; *Wright.* On Mount Ben Moore, New Mexico; *Bigelow.*

VITIS CALIFORNICA, *Benth. Bot. Sulph, p.* 10. San Diego and other parts of California, July; *Parry.* Sonora; *Thurber, Capt. E. K. Smith.*

AMPELOPSIS QUINQUEFOLIA, *Michx. Fl.* 1, *p.* 159. On the Mimbres and at the Copper Mines, New Mexico, June—July; *Bigelow.*

RHAMNACEÆ.

ADOLPHIA INFESTA, *Meisn. Gen. p.* 70; *Gray, Pl. Wright.* 1, *p.* 34. Monterey and near San Diego, California, March—May; *Parry.* Hills near Rock creek, Texas; July (flowers and fruit); *Bigelow, Parry.*

CEANOTHUS GREGGII, *Gray, Pl. Wright.* 2, *p.* 28. Guadaloupe Pass; April; Sonora; *Parry;* and San Luis mountains in the same State; *Capt. E. K. Smith.*

CEANOTHUS OVALIS, *Torr. & Gray, Fl.* 1, *p.* 265. Dry ravines, valley of the Pecos, Texas, and San Felipe; *Bigelow.*

CEANOTHUS DIVARICATUS, *Nutt. in Torr. & Gray, l. c.*, var. EGLANDULOSUS, *Torr. in Bot. Whipp. Rep. l. c. p.* 75. Mountains eastof San Diego, California, June (fruit); *Parry.*

CEANOTHUS SOREDIACUS, *Hook. & Arn. Bot. Beechey, p.* 329; *Torr. & Gray, l. c.* On the conglomerate and sandstone hills above San Diego; *Parry.* C. Lobbianus, *Hook. Bot. Mag. t.* 4811, seems to be hardly distinct from our plant.

CEANOTHUS THYRSIFLORUS, *Eschsch. in Mem. Acad. St. Petersb.* 1826; *Torr. & Gray, Fl. l. c.* Common in the neighborhood of Monterey and San Diego, as well as in many other parts of California, where it is known by the name of California lilac.

CEANOTHUS SPINOSUS, *Nutt. l. c.* Near Santa Barbara, California; March; *Parry.* Flowers white, with a tinge of blue. Leaves sometimes distinctly toothed at the apex. The branches are not thorny in our specimens.

CEANOTHUS CUNEATUS, *Nutt. l. c.* C. macrocarpus, *Nutt. l. c.* Near San Luis Obispo and Santa Barbara, California, April; *Parry.* There can be no doubt of the propriety of uniting the two species here quoted. We have specimens collected from numerous localities, which show a transition from the one to the other.

CEANOTHUS RIGIDUS, *Nutt. l. c.; Benth. Pl. Hartw. p.* 302; *Lindl. & Paxt. Fl. Gard.* 1, *p.* 74, *t.* 51. (TABLE IX.) On dry hills, Monterey, California, April; *Parry.* An evergreen shrub about 5 feet high, with rigid branches. The leaves vary greatly in form, being sometimes broadly obovate and often deeply emarginate.

CEANOTHUS DENTATUS, *Torr. & Gray, Fl. l. c.; Lindl. & Paxt. Fl. Gard.* 1, *p.* 17, *t.* 4. (TABLE X.) Sandy soils around Monterey, California; *Parry*. A low bush. Our specimens correspond with Douglas's plant, except that in the latter the flowers are said to be white, whereas they are blue in the former. They had, no doubt, faded in the specimens from which the original description was drawn.

CEANOTHUS CRASSIFOLIUS, (n. sp.): fruticosus, erectus; ramulis teretibus albo-tomentosis; foliis ovatis obtusiusculis integerrimis crassis penninerviis subtus dense albo-tomentosis glabris minute papillaris opacis; thyrsis subsessilibus brevibus subumbelliformibus densifloris. (TABLE XI.) Mountains south of Los Angelos, February; *Parry*. A shrub 4 to 5 feet high, much branched. Leaves 1—1½ inch long, remarkably thick and coriaceous, revolute on the margin when dry, pale dull green above and appearing rough like shagreen under a lens; petiole 2—3 lines long, thick. Clusters of flowers terminal, and in the axils of the upper leaves. Calyx and corolla white. Ovary marked with 3 minute protuberances. Fruit not known.

FRANGULA CAROLINIANA, *Gray, Gen. Ill.* 2, *p.* 178, *t.* 167. Rhamnus Carolinianus, *Walt. Fl. Car. p.* 101. Banks of streams, Los Muros, &c., Western Texas; *Bigelow*.

FRANGULA CALIFORNICA, *Gray, l. c., & Pl. Wright.* 2, *p.* 28. Mountain ravines near Camp Bache, Western Texas; *Bigelow*. Sonora; *Schott, Capt. E. K. Smith*. Monterey and San Diego, California; *Parry*. Variable in the form and pubescence of the leaves. We quite agree with Dr. Gray, that this species includes Rhamnus Californicus, *Esch.*, R. oleifolius, *Hook.*, R. laurifolius, *Nutt.* R. leucodermis, *Nutt.*, and R. tomentellus, *Benth.*

RHAMNUS CROCEUS, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 261. Around Monterey and San Diego, also on the mountains of southern California; *Parry*. The leaves vary from ½ to 1½ inch in length, and from obovate-oblong to broadly ovate. The under surface is always yellowish. The fruit in Dr. Parry's specimens is all 2-seeded.

ZIZYPHUS PARRYI, (n. sp.): glabra; ramis spinosis; foliis obovatis integerrimis sub-coriaceis penninerviis; pedunculis unifloris, fructiferis recurvis; drupa sub-exsucca ovata apiculata 3-loculare; nuce crassissima ossea 3-loculari 3-sperma. Gravelly ravines near San Felipe, California, June (in fruit); *Parry*. It was afterwards found at the same place by Mr. Thurber. A shrub 4—6 feet high, much branched; the branches smooth, flexuous, and armed with numerous slender leafy spines. Leaves 8—12 lines long, obtuse or sometimes retuse, abruptly tapering at the base into a short petiole; stipules minute, subulate, deciduous. Only a solitary flower was found. This was minute and pentamerous, the very small concave petals partly embracing the stamens. Peduncles solitary, or sometimes 2—3 together, arising from short branches or spurs; those of the fruit about half an inch long and recurved. Drupes 6—8 lines long, with a short abrupt point, lemon yellow, the pulp very thin. Nutshell extremely thick and hard. Seeds narrowly oblong. Albumen very thin. Embryo linear, oblong, green. This must be a very rare plant, as it has been found but twice, and in both cases near the same spot. In its nearly dry 3-celled fruit and extremely thick shell it resembles Z. xylopyra of India.

ZIZYPHUS OBTUSIFOLIA, *Gray, Gen. Ill.* 2, *p.* 170, *t.* 163; *& Pl. Lindh.* 2, *p.* 168. Dry hills and banks from El Paso to Eagle Pass, on the Rio Grande; March—June; abundant.

ZIZYPHUS LYCIOIDES, *Gray, l. c.* Near Elceario, on the Rio Grande, June (in fruit); *Parry*. Valley of the Gila; *Thurber*. Dr. Gregg found it between Matamoras and Mapini. The fruit is black and somewhat astringent, but edible.

CONDALIA SPATHULATA, *Gray, Pl. Wright.* 1, *p.* 32. Ravines on the Rio Concha; *Bigelow.* Eagle Pass, Texas, and Sonora; *Schott.*

CONDALIA OBOVATA, *Hook. Ic. t.* 287; *Torr. & Gray, Fl.* 1, *p.* 685; *Gray, Gen. Ill.* 2, *t.* 164. Sandy plains, Eagle Pass, and upward to El Paso, April; *Bigelow.* Tucson, Sonora; *Parry.*

COLUBRINIA TEXENSIS, *Gray, Pl. Lindh.* 2, *p.* 169; *Pl. Wright.* 1, *p.* 33. Plains between the Pecos and the Rio Grande. The leaves on the young shoots are sometimes 4 inches long and 3 inches wide, but on the older branches they are much shorter.

KARWINSKIA HUMBOLDTIANA, *Zucc.; Gray, Pl. Wright.* 1, *p.* 72. Between the Rio Grande and the Pecos and Devil's river; May—July.

CELASTRACEÆ.

MORTONIA SPABRELLA, *Gray, Pl. Wright.* 2, *p.* 28. Mountains of El Paso and of Chihuahua, opposite San Elceario, May—June; *Parry, Bigelow.*

MORTONIA SEMPERVIRENS, *Gray, Pl. Wright.* 1, *p.* 35, *t.* 4. On the Pecos, western Texas.

MORTONIA GREGGII, *Gray, l. c.* (*adnot.*) Calcareous hills, Ringgold Barracks, May; *Schott.*

GLOSSOPETALON SPINESCENS, *Gray, Pl. Wright.* 2, *p.* 29, *t.* 12. *B.* Mountains and rocky places, El Paso, March; *Bigelow.*

MAYTENUS PHYLLANTHOIDES, *Benth. Bot. Sulph. p.* 54. Lower Rio Grande (in fruit); *Schott.* A native also of the bay of Magdalena, California, and of Key West, Florida. Cotyledons thick, and albumen very thin in this species.

PACHYSTIMA MYRSINITES, *Raf.; Gray, Pl. Fendl. p.* 29. Sides of Ben More, New Mexico, June; *Bigelow.*

SCHÆFFERIA CUNEIFOLIA, *Gray, Pl. Wright.* 1, *p.* 35. Western Texas, along the lower Rio Grande, March (male flowers); *Schott.*

ACERACEÆ.

ACER MACROPHYLLUM, *Pursh, Fl.* 1, *p.* 267; *Hook. Fl. Bor.-Am.* 1, *p.* 112, *t.* 38. Mountain ravines, Santa Barbara, California; *Parry.*

NEGUNDO ACEROIDES, *Moench*; *Torr. & Gray, Fl.* 1, *p.* 260. N. Californicum, *Torr. & Gray, l. c. Nutt. Sylv.* 2, *p.* 90, *t.* 72. In various parts of California; *Parry.*

SAPINDACEÆ.

SAPINDUS MARGINATUS, *Willd; Gray, Gen. Ill.* 2, *t.* 150. Along the Rio Grande and its tributaries; also near the Copper Mines, New Mexico, and in Sonora.

CARDIOSPERMUM HALICACABUM, *Linn.* Western Texas, and on the lower Rio Grande; *Schott.*

SERJANIA INCISA, (n. sp.) foliis impari-bipinnatis; pinnis bijugis trifoliatis; foliolis ovato-rhomboideis serrato-incisis utrinque pubescentibus, petiolis subalatis; carpellorum alis semi-oblongis. Mountains of Santa Rosa, Cohahuila; *Bigelow.* A vine 3—8 feet long. Leaflets 1—1½ inch long, acute at each end, with 2—3 coarse teeth on each side; the petiole more or less distinctly winged. Peduncles about two-thirds the length of the leaves. Panicle an inch or more long, racemiform, usually with 2 or 3 tendrils at the base. Sepals oblong. Petals strongly appendiculate on the inside. Fruit 1½ inch long, at first pubescent, but nearly smooth when old; seed-bearing portion reticulately veined; wings 3—5 lines wide, rather obtuse at

the base. We think this can hardly be S. racemosa, nor can we refer it to any described species of Serjania. The leaves in all our specimens are pinnate, and the pinnæ trifoliate.

URVILLEA MEXICANA, *Gray, l. c. (adnot.)* Rich soil, among rocks. Monterey, Neuvo Leon, *Thurber*. It was found some years before, in the same place, by Dr. Gregg, Dr. Edwards, and Major Eaton. Taumilapas; *Berlandier*, No. 2269.

DODONÆA SCHEIDIANA, *Schlecht. in Linnæa*, 18, *p.* 49. In various parts of Sonora; *Thurber, Schott.*

ÆSCULUS CALIFORNICA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 251, *& Sylva*, 2, *p.* 69, *t.* 74. *Newberry, Bot. Williamson in Pacif. R Road Expl.* 6, *p.* 21, *fig.* 1. Near Monterey and San Luis Obispo, California, May; *Parry*.

UNGNADIA SPECIOSA, *Endl. Atakt. t* 36; *Gray, Gen. Ill.* 2, *t.* 178 *& 179*. Dry ravines, Organ mountains of New Mexico, March—April; *Bigelow*. Hueco mountains, Texas; *Thurber*.

MALPIGHIACEÆ.

GALPHIMIA LINIFOLIA, *Gray, Gen. Ill.* 2, *p.* 196, *t.* 173. Limestone hills and plains on the Rio Grande and its tributaries, western Texas.

MALPIGHIA GLABRA, *Linn.; DC. Prodr.* 1, *p.* 578. On the lower Rio Grande, September—October (flowers and fruit); *Schott*. Dr. Edwards found it near Monterey, Neuvo Leon. It is a shrub 1—4 feet high, growing in densely bushy places.

JANUSIA GRACILIS, *Gray, Pl. Wright.* 1, *p.* 38; *& 2, p.* 30; *Torr. Bot. Parkes, in Pacific R. Road Expl.* 7, *p.* 9, *t.* 1. From the Limpio mountains to El Paso, and west to Chihuahua and Sonora.

ASPICARPA LONGIPES, *Gray, Pl. Wright.* 1, *p.* 38 *& 2, p.* 30. Rocky hills near the Limpia river, July—September; *Bigelow*. Sierra del Pajarito, Santa Cruz, Sonora; *Thurber, Schott.*

ASPICARPA HYSSOPIFOLIA, *Gray, Pl. Lindh.* 2, *p.* 167; *& Pl. Wright.* 1, *p.* 36. Limestone hills along the lower Rio Grande, October; *Schott*.

HIRÆA SEPTENTRIONALIS, *Ad. Juss. Monog. Malpigh. p.* 309. Var. foliis minoribussæ pissime oblongo-lanceolatis, *Gray, Pl. Thurb. p.* 303 (*adnot.*) Between Reyon and Ures, Sonora; *Thurber*. Dr. Edwards collected it near Monterey, Neuvo Leon. It is a shrub 6—8 feet high.

POLYGALACEÆ.

POLYGALA PUBERULA, *Gray, Pl. Wright.* 2, *p.* 30. Hills between Van Horn's Wells and Muerte; and on the mountains of Leona; June—August; also at the Copper Mines, and on the Rio Mimbres.

POLYGALA LINDHEIMERI, *Gray, pl. Lindh.* 2, *p.* 150; *& Pl. Wright.* 1, *p.* 39. Hills and plains, western Texas; New Mexico and Sonora; June—September.

POLYGALA OVATIFOLIA, *Gray, Pl. Wright.* 1, *p.* 39. Limestone rocks on the Rio Grande from Eagle Pass up to the San Pedro and Pecos; *Schott, Bigelow*.

POLYGALA ALBA, *Nutt. Gen.* 2, *p.* 87; *Gray, Pl. Wright. l. c.* Gravelly hills on the Rio Grande from New Mexico to the lower river. Valley of the Santa Cruz river, Sonora; *Capt. E. K. Smith*.

POLYGALA SCOPARIA, *H. B. K. Nov. Gen.* 5, *p.* 399; var. MULTICAULIS, *Gray, l. c.* Hills and ravines at El Paso; also at Eagle Springs, Texas; *Bigelow, Parry*.

POLYGALA HEMIPTEROCARPA, *Gray, Pl. Wright.* 2, *p.* 31. Rocky hills near Camp Bache, Texas, July; *Bigelow.* Sierra del Pajarito; *Schott.*

POLYGALA MACRADENIA, *Gray, l. c.* 1, *p.* 39. Hills on the Rio Grande, from El Paso to Eagle Pass; June.

POLYGALA NUTKANA, *Moc. & Sessé; DC. Prodr.* 1, *p.* 331. P. cucullata, *Benth. Pl. Hartw. p.* 229. P. Californica, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 671. (TAB. XII) Near Monterey, May; *Parry.* We have seen specimens of this plant with radical flowers, so that no doubt Nuttall's P. Californica is the same as P. Nutkana.

MONNINA WRIGHTII, *Gray, l. c.* 2, *p.* 31. Copper Mines, New Mexico, Aug.; *Bigelow.*

KRAMERIACEÆ.

KRAMERIA LANCEOLATA, *Torr. in Ann. Lyc. N. York,* 2, *p.* 168; *Gray, Gen. Ill.* 2, *t.* 185. Hill-sides along the Rio Grande, from El Paso to Laredo, April—July. Cañon of Guadaloupe, Sonora; *Capt. E. K. Smith.*

KRAMERIA PARVIFOLIA, *Benth. Bot. Sulph. p.* 6, *t.* 1; *Gray, Pl. Wright.* 1, *p.* 42. Ravines and hills, western Texas, particularly along the upper Rio Grande and at Guadaloupe cañon, Sonora; *Capt. E. K. Smith;* also on the border of the California desert, near San Felipe, June; *Parry.* Var. RAMOSISSIMA, *Gray, l. c.* Devil's river, Leon Springs, and Presidio del Norte.

KRAMERIA CANESCENS, *Gray, Pl. Wright. l. c.* (TAB. XIII.) Hills on the Rio Grande, from El Paso to the mouth of the Cibolo, June—July; *Bigelow.*

LEGUMINOSÆ.

VICIA PULCHELLA, *H. B. K.*; Var. foliolis majoribus, etc., *Gray, Pl. Wright.* 2, *p.* 32. Hills at the Copper Mines, New Mexico, August; *Bigelow.*

VICIA EXIGUA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 272. Hill-sides, southern New Mexico, Chihuahua, and southern California, April—June.

LATHYRUS LINEARIS, *Nutt. l. c.* On the Rio Mimbres and at the Copper Mines, New Mexico, June, (in flower and fruit;) *Bigelow.*

LATHYRUS VESTITUS, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 276. Napa county, California, March; *Thurber.*

LATHYRUS PALUSTRIS, *Linn.* var.? foliis elongatis angustis, etc.; *Gray, Pl. Wright.* 2, *p.* 32. Western Texas, and at the Copper Mines; also in Cohahuila and Sonora.

LATHYRUS POLYMORPHUS, *Nutt. Gen.* 2, *p.* 97. In wet places, Sonora; *Thurber.*

LATHYRUS VENOSUS, *Muhl. in Willd. Sp.* 3, *p.* 1092? In shady places near San Diego, California, May; *Thurber.* A form with emarginate leaflets.

LATHYRUS MARITIMUS, *Bigel. Fl. Bost. ed.* 2, *p.* 268; *Torr. & Gray, Fl.* 1, *p.* 273. Near San Diego, March; *Parry.* Peduncles, petioles, and calyx pubescent. Leaflets 8—12, mostly alternate, varying from ovate to elliptical-oblong, glabrous, scarcely half as large as in the eastern plant. Stipules broadly cordate-hastate, nearly as long as the leaflets. Peduncles 6—10-flowered.

PHASEOLUS RETUSUS, *Benth. Pl. Hartw. p.* 11; *Gray, Pl. Lindh.* 2, *p.* 170. Valley of the Limpio, and near the Copper Mines, July—August; *Parry, Bigelow.*

PHASEOLUS WRIGHTII, *Gray, Pl. Wright.* 1, *p.* 43. Mountains and rocky places along the middle Rio Grande, and at the Copper Mines, July—August. Dr. Bigelow found at Eagle Pass what seems to be a variety of this species, in which the leaflets of the lower leaves are entire.

PHASEOLUS ANGUSTISSIMUS, *Gray, Pl. Wright.* 2, *p.* 33. Dry ravines on the Cibolo, a tributary of the Rio Grande, Cohahuila, July; *Bigelow.*

PHASEOLUS, MACROPOIDES, *Gray, l. c.* Hills at the Copper Mines, August; *Bigelow.*

PHASEOLUS ATROPURPUREUS (n. sp.:) caulibus volubilibus retrorsim pubescentibus; stipulis minutis subulatis; foliolis lanceolatis basi dilatatis utrinque pubescentibus lateralibus ad basim unilobatis, terminati trilobo; pedunculis folio multoties longioribus paucifloris; calycibus subsessilibus, laciniis inferioribus lanceolato-subulatis, superioribus triangulari-lanceolatis, alis corollæ late ovatis (atropurpureis) vexillo duplo longioribus; leguminibus deflexis lineari-falcatis 7—9-spermis. Rocks on the Rio Cibolo of the Rio Grande, and ravines, Bufitillo; *Bigelow.* Presidio del Norte, July—August; *Parry.* Leaflets 1½—2½ inches long, tapering to a long narrow point; the lateral ones with large acute lobe on the outer side at the base; the terminal leaf more or less dilated at the base, and usually 3-lobed, but sometimes (especially in the lower leaves) only obscurely lobed. Peduncle 8—12 inches long, and still more elongated in fruit. Flowers 6—10, at first approximated toward the extremity of the peduncle, but afterwards distant. Pods about 3 inches long and 2 lines wide. Seeds oblong, compressed, about 2½ lines long, and 1½ wide; smooth, greyish, speckled with dark purple. This seems to be quite distinct from any Phaseolus hitherto described. Mr. Schott found on the sea beach at Brazos Santiago, Texas, a plant allied to this, but much more downy, and the leaflets half as large, ovate, obtuse, with very short lobes. The specimens are not sufficiently complete for a more minute comparison.

VIGNA VILLOSA, *Savi.? DC. Prodr. l.* 2, *p.* 40. Thickets on the Rio Grande, between Ringgold Barracks and Laredo; *Schott.* If, as is probable, this and V. glabra are not specifically distinct, it ought to be called V. luteola, the genus Vigna having been founded on Dolichos luteolus, *Jacq.*

ERYTHRINA CORALLOIDES, *Moc. & Sesse in DC. Prodr.* 2, *p.* 413? *Gray, Pl. Thurb. p.* 301. Bachuachi and Gaudaloupe cañon, June (in flower) and August (in fruit); *Thurber.* Summit of mountains north of Imores; *Capt. E. K. Smith;* and Sierra del Pajarito, in the same State; *Schott.* I have followed Dr. Gray in naming this plant, but it does not well accord with the description of De Candolle. The leaves are broader than long, and the petioles in our specimens are more or less prickly. Indeed, it scarcely differs from E. herbacea, of the southern States, for that species becomes shrubby in Florida, and the stem, as well as the petioles, prickly.

RHYNCHOSIA TEXANA, *Torr. & Gray, Fl.* 1, *p.* 687. Western Texas; also near the Copper Mines and Sonora, May—June.

RHYNCHOSIA TEXANA, VAR. ANGUSTIFOLIA, *Gray, Pl. Wright.* 1, *p.* 44. Mountain ravines, between Van Horn's Wells and Muerte, July; *Parry, Bigelow.*

RHYNCHOSIA MENISPERMOIDEA, *DC. Prodr.* 2, *p.* 384. Sandy places, low land, Texas, June; *Thurber, Bigelow.*

CENTROSEMA VIRGINIANA, *Benth.; Torr. & Gray, Fl.* 1, *p.* 296. Var. foliolis minoribus angustioribusque. Brazos Santiago, May; *Schott.*

GALACTIA MARGINALIS, *Benth.; Torr. & Gray, Fl.* 1, *p.* 288. Western Texas, near the Rio Grande; *Parry.*

GALACTIA TEPHRODES, *H. B. Kth.; Gray, Pl. Wright.* 2, *p.* 34. Ravines near Rock creek; *Bigelow.* Janos, Chihuahua; *Thurber.*

GALACTIA CANESCENS, *Benth.; Torr. & Gray, Fl.* 1, *p.* 288. Sandy places between Ringgold Barracks and Laredo, Texas; *Schott.*

GALACTIA WRIGHTII, *Gray, Pl. Wright.* 1, *p.* 44. Sierra del Pajarito, July; *Schott.*

COLOGANIA PULCHELLA, *H. B. Kth.; Gray, l. c. p.* 45, *& 2, p.* 34. Ravines near the Copper Mines; rocky hills near Muerte, and mountains of Muerte, July—Augnst; *Bigelow.*

COLOGANIA LONGIFOLIA, *Gray, l. c.* 2, *p.* 35. Ravines near Camp Bache, western Texas, and at the Copper Mines; *Bigelow.* A large leaved form.

DAUBENTONIA LONGIFOLIA, *DC. Mem. Leg. & Prodr.* 2, *p.* 267; *Torr. & Gray, Fl. p.* 283. Banks of the Rio Grande from Laredo down to the coast; *Schott.* Rio Coleto, Texas; *Thurber.* A large shrub, with showy racemes of bright yellow flowers. The seeds are used as a substitute for coffee.

DAUBENTONIA? THURBERI, *Gray, Pl. Thurb. p.* 313. Hill-sides, Mabibi, Sonora, June; *Thurber.*

GLOTTIDIUM FLORIDANUM, *DC. Prodr.* 2, *p.* 266; *Torr. & Gray, Fl.* 1, *p.* 294. Southwestern Texas, September; *Thurber.*

SESBANIA MACROCARPA, *Muhl.; DC. l. c.; Torr. & Gray, l. c.* Shore of the lower Gila, near its confluence with the Colorado; *Schott.* Cocospera, Sonora; *Thurber.*

PETERIA SCOPARIA, *Gray, Pl. Wright.* 1, *p.* 50. Gravelly hills near Rock creek, and between Van Horn's Mills and Eagle Springs, between the Pecos and the Rio Grande, July, *Bigelow.*

PICKERINGIA MONTANA, *Nutt. in Torr. and Gray, Fl.* 1, *p.* 389.—(Tab. XIV.) Hills near Monterey, May; *Parry.* The fruit of this interesting shrub is still a desideratum.

TEPHROSIA LINDHEIMERI, *Gray, Pl. Lindheim.* 2, *p.* 172. Hills on the Lower Rio Grande, April; *Schott.*

TEPHROSIA LEUCANTHA, *H. B. K.? Gray, Pl. Wright.* 2, *p.* 36. Santa Cruz and Mabibi, Sonora; September (in fruit); *Thurber.* Sierra Verde, in the same State; *Schott.*

TEPHROSIA TENELLA, *Gray, l. c.* Santa Cruz, September; *Thurber,* and Sierra de la Union; Sonora, July; *Schott.*

INDIGOFERA LINDHEIMERIANA, *Scheele in Linnæa,* 21, *p.* 464; *Gray, Pl. Wright.* 1, *p.* 45. Central and western Texas, August—September.

INDIGOFERA LEPTOSEPALA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 298. Valley of the Pecos, &c.; September.

PSORALEA FLORIBUNDA, *Nutt. l. c. p.* 30. Gravelly hills, Rock creek, and at the Copper Mines; also in Sonora, south of the boundary line.

PSORALEA ESCULENTA, *Pursh, Fl.* 2, *p.* 475, *t.* 22. Fields near the Presidio del Norte, August; *Parry.* Luxuriant specimens, with the leaves all crisped, undulate on the margin.

PSORALEA ORBICULARIS, *Lindl. Bot. Reg. t.* 1971; *Torr. & Gray, Fl.* 1, *p.* 304. Near San Luis Obispo and other parts of California, April; *Parry.* Peduncles often more than a foot long, and the petioles of nearly the same length. The spike is at first short and capitate, but in full flower is sometimes 6 inches long.

PSORALEA MACROSTACHYA, *DC. Prodr.* 2, *p.* 220; *Torr. & Gray, Fl.* 1, *p.* 689. Banks of rivers, San Luis Rey, California, October; *Parry.*

PSORALEA PSYCODES, *Dougl. in Hook. Fl. Bor.-Am.* 1, *p.* 136. In moist places near Monterey, California, May; *Parry.* Our specimens accord exactly with Douglas' Californian plant, and therefore belong to the var. *β. Hook. l. c.*

EYSENHARDTIA AMORPHOIDES, *H. B. K. Nov. Gen. & Sp.* 6, *p.* 489, *t.* 592. Common in western Texas, along the Rio Grande, also in Cohahuila, Chihuahua, and Sonora, May—September.

DALEA FORMOSA, *Torr. in Ann. Lyc. N. Y.* 2, *p.* 178; *& in Emory Rep. t.* 1. Gravelly and rocky hills and prairies along the Rio Grande, from Frontera down to Eagle Pass, also in Cohahuila, April—July. A highly ornamental little shrub, bearing a profusion of bright rose-colored flowers.

DALEA POGONATHERA, *Gray, Pl. Wright.* 1, *p.* 48. Hills along the Rio Grande and its tributaries in western Texas and the Mexican States, April—August.

DALEA LASIATHERA, *Gray, l. c.* Plains near Howard's Springs, September; *Bigelow.* Central Texas; *Thurber.*

DALEA BRACHYSTACHYXS, *Gray, l. c.* 2, *p.* 39. Plains, Leon Springs, September; *Bigelow.* Sonora; *Thurber.*

DALEA POLYGONOIDES, *Gray, l. c.* Hills near the Copper Mines, New Mexico, October; *Bigelow.*

DALEA FILIFORMIS, *Gray, l. c.* With the last; *Bigelow.* Also between Janos and Santa Maria river, Sonora, September; *Schott.*

DALEA LÆVIGATA, *Gray, l. c.* With the last; *Bigelow, Thurber.* Dry rocky places, valley of the Santa Cruz, Sonora; *Captain E. K. Smith.*

DALEA ALBIFLORA, *Gray, l. c. p.* 38. Hills near the Copper Mines, August—October; *Bigelow.* San Pedro, Sonora; *Thurber.*

DALEA ALOPECUROIDES, *Willd.; Gray, Pl. Fendl. p.* 31. Santa Cruz, Sonora, May—September; *Thurber, Captain E. K. Smith.*

DALEA WISLIZENI, *Gray, Pl. Fendl. p.* 32, *& Pl. Wright.* 2, *p.* 38. Santa Cruz, Sonora, September; *Thurber.*

DALEA AUREA, *Nutt. Gen.* 2, *p.* 101. Dry rocky places in the valley of the Limpio, July; *Bigelow.* Arroyo los Moros, on the Rio Grande, August; *Schott.*

DALEA NANA, *Torr. in Pl. Fendl. p.* 31; var. elatior, &c. *Gray, Pl. Wright.* 1, *p.* 46. Hills along the Rio Grande and its tributaries from New Mexico to Laredo, June—August.

DALEA WRIGHTII, *Gray, Pl. Wright.* 1, *p.* 49. Hill sides Frontera, and between the San Pedro and Pecos, May—October. Cañon of the Guadaloupe river, Sonora, April; *Capt. E. K. Smith.*

DALEA JAMESII, *Torr. & Gray, Fl.* 1, *p.* 308. Gravelly hills, Rock Creek, and plains along the Limpio, May—July; *Bigelow.* Mule Springs, New Mexico; *Thurber.*

DALEA LACHNOSTACHYS, *Gray, Pl. Wright.* 1, *p.* 46. With the last; *Parry, Bigelow.*

DALEA MOLLIS, *Benth. Pl. Hartw. p.* 306. Hills and rocky places along the Rio Grande, Texas, westward to the Colorado desert, California; February—July.

DALEA LANATA, *Spreng. Syst.* 3, *p.* 327. Sandy ravines and hill sides on the Rio Grande, Texas; also in Cohahuila and Chihuahua, September.

DALEA ARGYRÆA, *Gray, Pl. Wright.* 1, *p.* 47. Rocky hills between the Nueces and the Rio Grande, September.

DALEA GREGGII, *Gray, Pl. Thurb. p.* 315. Agua Prieta, March; *Parry.* Cerro Gordo, in Durango; *Thurber.* Sierra del Pajarito, Sonora, July; *Schott.* Leaflets sometimes only 3. Flowers bright rose color.

DALEA EMORYI, *Gray, l. c.; Torr. in Pacif. R. Road Expl.* 6, *p.* 360, *t.* 11. Valley of the Gila, May—July; *Schott, Thurber.*

DALEA SCOPARIA, *Gray, Pl. Fendl. p.* 32, *& Pl. Wright.* 1, *p.* 47. Sandy hills near Elcario, June; *Bigelow.* Laguna de los Patos, Chihuahua; *Thurber.*

DALEA FRUTESCENS, *Gray, Pl. Lindh.* 2, *p.* 175. Hills and rocky places along the Rio Grande and its tributaries, August—September.

DALEA SPINOSA, *Gray, Pl. Thurb. p.* 315; *Torr. Bot. Parke, in Pacif. R. Road Expl.* 7, *p.* 9, *t.* 3. On the lower Rio Gila; *Thurber.* Dry beds of rivers in the Californian desert; *Schott.* The leaves of young shoots and seedlings are obovate-oblong, toothed and dotted with glands.

DALEA SCHOTTII (n. sp.): fruticosa; ramis flexuosis glaberrimis, ramulis in spinas subpungentes abeuntibus; foliis simplicissimus sparsis anguste linearibus; pedunculis 2–3-floris; calycis dentibus late ovatis tubo glabro eglanduloso duplo brevioribus; corolla violacea. Diluvial banks of the Colorado, February; *Schott.* Branches zigzag, smooth, yellow. Leaves 8–10 lines long, scarcely a line wide, hoary-pubescent above, green, and marked with row of impressed dots on each side underneath. Flowers produced at the extremity of short branches, usually two together, on short pedicels; the bracts resembling the leaves, only smaller. Calyx without glands, somewhat turbinate, smooth, the broad teeth pubescent on the margin. Corolla deep violet. Pods not seen.

PETALOSTEMON EXILE, *Gray, Pl. Wright.* 2, *p.* 51. Hills and rocky places at the Copper Mines, New Mexico, September; *Bigelow.* Santa Cruz, Sonora; *Thurber.*

PETALOSTEMON CANDIDUM, *Michx. Fl.* 2, *p.* 49, *t.* 37, *f.* 1. Near the Copper Mines, and low places between Van Horn's Wells and Muerte, July; *Bigelow.* Rio de Sta. Cruz and Prodrero, Sonora, June; *Schott.* Our plant resembles Fendler's specimens named P. gracile by Dr. Gray, but it is erect.

PETALOSTEMON EMARGINATUM, *Torr. & Gray, Fl.* 1, *p.* 311. Near Ringgold Barracks; *Schott.* We have never before received specimens of this plant since it was sent to us from Drummond's Texan collection.

ROBINIA NEO-MEXICANA, *Gray, Pl. Thurb. p.* 315. Along the Mimbres, New Mexico; *Thurber,* and on Ben Moore, near the Copper Mines; *Bigelow.*

AMORPHA LAEVIGATA, *Nutt.* var. PUBESCENS, *Gray, Pl. Wright.* 1, *p.* 49. Hills at the Copper Mines, and on the Rio Grande below the mouth of Escondido creek, March; *Bigelow, Schott.* Hardly distinct from the next.

AMORPHA FRUTICOSA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 305. A. Californica, *Nutt. l. c.* Mountains east of San Diego, California; *Parry.* Mabibi, Sonora, June; *Thurber.* I can find no reliable characters for distinguishing the two species here united. Mr. Nuttall's plant was described from specimens in which the flowers were scarcely unfolded, and the fruit of which was not collected.

GLYCYRRHIZA LEPIDOTA, *Nutt. Gen.* 2, *p.* 106; *Bot. Mag. t.* 2150; *Gray, Pl. Wright.* 1, *p.* 50. G. glutinosa, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 298. Valley of the Rio Grande below San Elcearío, June; *Thurber.* Ojo de Vaca, Chihuahua; *Thurber.* San Felipe, California; *Parry.*

MEDICAGO SATIVA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 321. Banks of the acequia, near El Paso, May; *Bigelow.* This is no doubt an introduced plant. It seems to be naturalized in many parts of the Mexican States.

MEDICAGO DENTICULATA, *Willd.; Torr. & Gray, l. c.* Naturalized in western Texas, New Mexico and the Mexican States west of the Rio Grande; also throughout California, wherever the Spanish missions were established.

MELILOTUS PARVIFLORA, *Desf.*; *Torr. & Gray, l. c.* M. occidentalis, *Nutt. l. c.* Western Texas, Chihuahua, Sonora and California, April—May. Introduced from Europe.

TRIFOLIUM FIMBRIATUM, *Lindl. Bot. Reg. t.* 1070; *Torr. & Gray, Fl.* 1, *p.* 317. Near San Diego, California, May; *Parry.* Napa and San Isabel in the same State; *Thurber.* All our specimens of this plant are clothed with a minute glandular pubescence. The leaflets are lanceolate or oblong-lanceolate, and conspicuously fringed with narrow spinulose serratures. Teeth of the calyx always entire, and broadly lanceolate at the base. Legumes 2-seeded. The Indians of California collect the seeds for food.

TRIFOLIUM HETERODON, *β. Torr. & Gray, Fl.* 1, *p.* 318. Monterey, California, May; *Parry.* Differs from the preceding in being glabrous, with oblong or obovate leaflets; the stipules much less cut; the calyx-teeth subulate from a narrow base; the two upper ones 2—3-cleft, and in the legumes 4—5-seeded.

TRIFOLIUM SPINULOSUM, *β. Torr. & Gray, l. c.* Near Monterey, California, May; *Parry.* Near the last, but distinguished by the entire teeth of the calyx, more laciniate stipules and 2-seeded legumes. From T. fimbriatum it differs in being glabrous, and in the much longer and narrower calyx-teeth.

TRIFOLIUM MACRÆI, *Hook. & Arn. Bot. Misc.* 3, *p.* 179. T. albo-purpureum, *Torr. & Gray, Fl.* 1, *p.* 319. Santa Barbara, California, April; *Parry.*

TRIFOLIUM TRIDENTATUM, *Lindl. Bot. Reg. sub t.* 1070. T. involucratum, *Torr. & Gray, l. c. non Willd.* Santa Barbara, California; *Parry.*

TRIFOLIUM INVOLUCRATUM, *Willd. Sp.* 3, *p.* 1372; *Gray, Pl. Wright.* 2, *p.* 41. Hills at the Copper Mines and along the Mimbres, New Mexico, June; *Bigelow.* Mabibi, Sonora; *Thurber.*

TRIFOLIUM BEJARIENSE, *Moricand, Pl. Nouv. Amer. p.* 2, *t.* 2. Western Texas, April; *Wright.*

TRIFOLIUM FUCATUM, *Lindl. Bot. Reg. t.* 1883; *Torr. & Gray, l. c.* T. physopetalum, *Fisch. & Mey. Ind. Sem. St. Petersb.* 1837, *p.* 18. Santa Barbara, and on the beach San Juan Capristano, California, March—May; *Parry.* San Isabel; *Thurber.* As tout species, easily distinguished by its very large head, and broadly lanceolate entire segments of the involucre.

TRIFOLIUM AMPLECTENS, *Torr. & Gray, l. c.* 1, *p.* 319; *Hook. & Arn. Bot. Beech. p.* 330, *t.* 78. San Fernando and San Luis Obispo, California; *Parry.*

TRIFOLIUM VARIEGATUM, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 317, Sonora, June; *Thurber.*

TRIFOLIUM MICROCEPHALUM, *Pursh, Fl.* 2, *p.* 478; *Torr. & Gray, l. c.* San Diego, California, May; *Thurber.*

HOSACKIA OBLONGIFOLIA, *Benth. Pl. Hartw. p.* 305. Mountains east of San Diego, California, June; *Parry.* Resembles H. bicolor, but differs in being pubescent, and in the narrowly oblong acute leaflets, as well as in other characters. The legume is straight, about an inch and a quarter long, and scarcely two lines wide. I have never seen H. bicolor with bracts, but in this species there is always a unifoliate bract to each head of flowers.

HOSACKIA GRACILIS, *Benth. in Linn. Trans.* 17, *p.* 365; *Torr. & Gray, Fl.* 1, *p.* 323. (TAB. XV.) Monterey, California, May. A rare species which we have received only from the vicinity of Monterey. It has much the appearance of a depauperate state of H. bicolor. The petiolate trifoliate bract is always present.

HOSACKIA STRIGOSA, *Nutt. in Torr. & Gray, l. c.* H. rubella, *Nutt. l. c.* Near Santa Barbara, California, March; *Parry.* Annual. Stem branching from the base; the branches 3—4

inches long. Flowers nearly one-third of an inch long. H. nudiflora, *Nutt.* seems hardly distinct from this species. In H. rubella we find on the same specimens some peduncles with unifoliolate bracts, and others in which the bracts are reduced to minute gland-like scales.

HOSACKIA PUBERULA, *Benth. Pl. Hartw. p.* 305; *Gray, Pl. Wright.* 1, *p.* 50; *Torr. Bot. Parke in Pacific R. Road Expl.* 7, *p.* 10, *t.* 4. Western Texas, New Mexico, Chihuahua, Sonora and California.

H. PUBERULA, var. NANA, etc., *Gray, l. c.* Organ mountains, New Mexico, *Bigelow.* Ojo de Vaca, Chihuahua; *Thurber.*—H. Wrightii, *Gray* seems to pass into this species. A variety with obovate leaflets was found by Schott, in the valley of the Gila, and by Captain E. K. Smith, in Sonora.

HOSACKIA PURSHIANA, *Benth.; Torr. & Gray, l. c.* Between Tucson and the Rio Gila, Sonora, March—September; *Parry, Thurber.* Monterey, California; *Parry.* Varies with the upper, and sometimes all the leaves unifoliolate, when it is the H. unifoliolata, *Hook. Fl. Bor.-Am.* 1, *p.* 135. This synonym was inadvertently overlooked in the Flora of North America, as it was also by Hooker in noticing the same form in *Pl. Geyer.*—(See Lond. Jour. Bot. 7. p. 210.)

HOSACKIA MARITIMA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 326. San Isabel, California, May; *Thurber.*

HOSACKIA SUBPINNATA, *Torr. & Gray, l. c.; Benth. Pl. Hartw. p.* 306. San Isabel, California, May; *Thurber.* H. Wrangeliana should probably be united to this species.

HOSACKIA BRACHYCARPA, *Benth. l. c.* Sonora; *Thurber.* The mature pod is nearly twice as long as the calyx, but is always much shorter than in H. subpinnata.

HOSACKIA ARGOPHYLLA, *Gray, Pl. Thurb. p.* 316. On rocks, San Isabel, California, May; *Thurber.*

HOSACKIA TOMENTOSA, *Hook. & Arn. Bot. Beechey, p.* 137; *Torr. & Gray, l. c.* Monterey, California; *Parry.*

HOSACKIA CYTISOIDES, *Benth. l. c.; Torr. & Gray, l. c.* β. Syrmatium glabrum, *Vogel?* Monterey, California, May; *Parry.* Leaflets mostly 3. Flowers reddish.

HOSACKIA SCOPARIA, *Nutt. in Torr. & Gray, l. c.* Ravines near San Diego, and in other parts of California, May; *Parry, Thurber.*

HOSACKIA JUNCEA, *Benth. l. c.* In the Colorado desert; *Schott.* Too near the last species.

ASTRAGALUS COBRENSIS, *Gray, Pl. Wright.* 2, *p.* 43, (*adnot.*) Copper Mines, New Mexico, April, and Ben Moore, Cohahuila, June (fruit); *Bigelow.*

ASTRAGALUS BIGELOVII, *Gray, l. c. p.* 42. Between the Rio San Pedro and the Rio Grande, western Texas; also at the base of the Organ mountains and near the Copper Mines, New Mexico; west to the Santa Cruz valley, Sonora; March—May.

ASTRAGALUS DIDYMOCARPUS, *Hook. & Arn. Bot. Beechey, p.* 334, *t.* 81; *Torr. & Gray, l. c.* High beach near San Juan Capristano, and at Santa Barbara, California, March; *Parry.* The leaflets in most of our specimens are narrowly cuneate-oblong, and notched at the summit.

ASTRAGALUS NUTTALLIANUS, *DC.; Torr. & Gray, Fl.* 1, *p.* 334; *Gray, l. c. p.* 52. Valleys of the Rio Grande and its tributaries in western Texas, New Mexico, Cohahuila and Chihuahua; also in Sonora; March—June. Variable in size, foliage, and other characters.

ASTRAGALUS HUMISTRATUS, *Gray, Pl. Wright.* 2, *p.* 43. Hills at the Copper Mines, June—July; *Bigelow, Thurber.* Leaflets more obtuse than in Wright's specimens.

ASTRAGALUS GLAREOSUS, *Dougl. in Hook. Fl. Bor.—Am.* 1, *p.* 152? Near the Copper Mines, May—June; *Bigelow.* Guadaloupe Pass, Sonora.

ASTRAGALUS HARTWEGI, *Benth. Pl. Hartw. p.* 19. El Podrero, near the 110° of longitude, Sonora; *Schott.*

ASTRAGALUS CYANEUS, *Gray, Pl. Fendl. p.* 34. Doña Ana, New Mexico, April; *Thurber.*

ASTRAGALUS VACARUM, *Gray, Pl. Wright.* 2, *p.* 43. Ojo de Vaca, Chihuahua; *Thurber.*

ASTRAGALUS (PHACA) TEPHRODES, *Gray, Pl. Wright.* 2, *p.* 45. Gravelly plains near the base of the Organ mountains and on the Mimbres, New Mexico, April—May; *Bigelow, Thurber.*

ASTRAGALUS (PHACA) FENDLERI, *Gray, l. c. p.* 44. Hills at the Copper Mines, October, (in fruit); *Bigelow.*

ASTRAGALUS (PHACA) SONORÆ, *Gray l. c.* Tubac, Sonora, March; *Parry.*

ASTRAGALUS (PHACA) THURBERI, *Gray, Pl. Thurb. p.* 312. Fronteras, Sonora, June; *Thurber.*

ASTRAGALUS (PHACA) LEUCOPSIS, *Torr. & Gray, Fl.* 1, *p.* 694. Phaca canescens, *Nutt. in Torr. & Gray, l. c. p.* 344, *non Hook. & Arn.* (TAB. XVI.) San Diego, California; *Parry, Schott.* The pods are about an inch and a quarter long, excluding the stipe, which is 4 lines long.

ASTRAGALUS (PHACA) CROTALARIÆ, *Benth. Pl. Hartw. p.* 307. (TAB. XVII.) Mountains east of San Diego, California, June, (with flowers and ripe pods;) *Parry.* A stout species, commonly 4—6 feet high.

ASTRAGALUS (PHACA) TRIFLORUS, *Gray, Pl. Wright.* 2, *p.* 45. Phaca triflora, *DC.* Sandy plains and mountains on the upper Rio Grande, in New Mexico and western Texas; also in Cohahuila; April.

OXYTROPIS LAMBERTI, *Pursh, var. Gray, Pl. Wright.* 1, *p.* 53. Hills near the Copper Mines, and Ojo Caliente; *Bigelow.*

CHÆTOCALYX WISLIZENI, *Gray, Pl. Wright.* 1, *p.* 51, & 2, *p.* 45. (TAB. XVIII, fig. 5—7.) Mount Carmel, and mountains of Santa Rosa, Cohahuila, October—November, (in fruit;) *Parry, Bigelow.*

CHÆTOCALYX SCHOTTII (n. sp.;) prostratus fere glaber; foliolis 5 ovatis acutis valde mucronatis concoloribus; dentibus calycis lineari-subulatis nudis tubo sub duplo-longioribus; carina alæ subæquantibus; staminibus superne æqualiter diadelphis. (TAB. XVIII.) Sierra Verde, Aroyo de los Samotas, Sonora, August; *Schott.* Stem branching from a somewhat woody base, slender, 2—3 feet long, twining towards the extremity. Leaflets 6—8 lines long, thin, those of the lowest leaves obtuse, the others acute and pointed with a conspicuous mucro. Flowers about six in axillary fascicles or short racemes. Pedicels rather shorter than the flowers. Calyx broadly campanulate, entirely destitute of glands. Corolla yellow. Vexillum ovate-oblong, emarginate, slightly pubescent. Wings and keel-petals oblong, acute. Stamens monadelphous below, diadelphous above, five on each side of the pistil. Ovary, mostly three-ovuled. Mature pod not known, but the young ones are 2—3-jointed; the terminal joint foliaceous and dilated. Differs from C. Wislizeni in the narrow acute leaves, and the long teeth of the calyx.

ZORNIA TETRAPHYLLA, *Michx. Fl.* 2, *p.* 76; *Torr. & Gray, Fl.* 1, *p.* 354. Laredo and Ringgold Barracks, June; *Schott.*

DESMODIUM GRAHAMI, *Gray, Pl. Wright.* 2, *p.* 48. Rocky places, on mountains of the Limpio river, and hills at the Copper Mines, July—August; *Bigelow.*

DESMODIUM ANNUUM, *Gray, l. c.* Santa Cruz, Sonora, September; *Thurber.*

DESMODIUM EXIGUUM, *Gray, l. c.* With the last; *Thurber.*

DESMODIUM PANICULATUM, *DC.; Torr. & Gray, Fl.* 1, *p.* 363. Devil's River valley, western Texas, (flowers and fruit), September; *Bigelow.*

DESMODIUM CINERASCENS, *Gray, l. c. p.* 48. Sonora, in various places, June; *Thurber.*

DESMODIUM WRIGHTII, *Gray, Pl. Lindh.* 2, *p.* 177. Dry mountain ravines, on the Limpio; July, (fruit;) *Bigelow.*

DESMODIUM NEO-MEXICANUM, *Gray, Pl. Wright.* 1, *p.* 53. Copper Mines, New Mexico, and Santa Cruz, Sonora, September; *Thurber.* A variety with broader and more strongly reticulated leaves than usual was found by Schott on the mountains of San Estaban, in Sonora.

LESPEDEZA VIOLACEA, *Pers.* var. SESSILIFLORA, *Torr. & Gray, Fl.* 1, *p.* 367. Central Texas; *Schott.*

CROTALARIA LUPULINA, *DC. Prodr.* 2, *p.* 133. Brazos Santiago, and Sonora, May; *Schott.* Chihuahua and Sonora; *Thurber.* Remarkable for its long spur-like projecting keel.

CROTALARIA SAGITTALIS, *Linn.; Torr. & Gray, Fl.* 1, *p.* 370. Sonora; *Thurber.*

LUPINUS DENSIFLORUS, *Benth. in Hort. Trans.* (*n. ser.*) 1, *p.* 409; *Torr. Pacif. Railroad Expl.* 4, *p.* 81. L. Menziesii; *Agardh, Syn. Lup. p.* 2. Monterey, California, May; *Parry.* San Diego; *Thurber.*

LUPINUS HIRSUTISSIMUS, *Benth. l. c.* San Pasqual, California, May; *Thurber.*

LUPINUS SUBCARNOSUS, *Hook. Bot. Mag. t.* 3467; *Gray, Pl. Wright.* 1, *p.* 54. L. Texensis; *Hook.* Western Texas, May—June; *Thurber.*

LUPINUS TRUNCATUS, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 373. San Diego, California, March—May; *Parry, Thurber.*

LUPINUS SPARSIFLORUS, *Benth. Pl. Hartw. p.* 303. Near San Diego, California, May; *Thurber.*

LUPINUS BICOLOR, *Lindl. Bot. Reg. t.* 1109; *Torr. & Gray, l. c.* San Pasqual, California, May; *Thurber.*

LUPINUS MICRANTHUS, *Dougl. in Bot. Reg. t.* 1251. Napa Mountains, California, March; *Thurber.*

LUPINUS PUSILLUS, *Pursh, Fl.* 2, *p.* 468. Gravelly plains near the Organ Mountains, and hills at the Copper Mines, New Mexico; also near Frontera, March—April. Tucson, Sonora, and valley of the Santa Cruz, Sonora; *Parry, Capt. E. K. Smith.*

LUPINUS RIVULARIS, *Lindl. Bot. Reg. t.* 1595; *Torr. & Gray, Fl.* 1, *p.* 376. San Diego, California; *Parry.*

LUPINUS CYTISOIDES, *Agardh, Lup. p.* 18. San Isabel, California, May; *Thurber.*

LUPINUS AFFINIS, *Agardh, l. c. p.* 20. Monterey, California; *Parry.*

LUPINUS MEXICANUS, *Lagasca; Gray, Pl. Wright.* 2. *p.* 49. On the mountain called Ben Moore, near the Copper Mines, and at Crucis, New Mexico, April—May; *Bigelow.*

LUPINUS ORNATUS, *Dougl. in Bot. Reg. t.* 1216. Napa county, California, March; *Thurber.*

LUPINUS DOUGLASII, *Agardh, Lup. p.* 34. South of San Louis Obispo, and near Monterey, California; *Parry.*

LUPINUS ALBIFRONS, *Benth.; Agardh, l. c. p.* 33. Monterey; *Parry;* and near San Pasqual, California, May; *Thurber.*

LUPINUS ARBOREUS, *Sims in Bot. Mag. t.* 682; *Agardh, l. c. p.* 25; *Benth. Pl. Hartw. p.* 303. Near San Diego and Monterey, California, May; *Parry.* A bushy shrub, with a stem which

is sometimes 1½ inch in diameter. It is a rare species in California, but is not uncommon in the gardens of Europe, into which it is generally thought to have been introduced from South America; but we strongly suspect that the seeds were brought by Menzies to England from California.

LUPINUS LITTORALIS, *Dougl.; Agardh, l. c. p.* 36. Monterey, California, May; *Parry.*

SOPHORA SERICEA, *Nutt. Gen.* 1, *p.* 280; *Gray, Pl. Wright.* 1, *p.* 54. Low moist places along the Rio Grande and its tributaries, from New Mexico to San Elceario; also in Coahuila; May—June.

SOPHORA SPECIOSA, *Benth.; Gray, Pl. Wright.* 1, *p.* 54. Rocky valley of the Pecos; September, (in fruit;) *Bigelow.* Fort Inge, Texas; *Parry.* Rinconada Pass, Neuvo Leon; *Thurber.*

SOPHORA TOMENTOSA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 389. Brazos, Santiago, Texas; May; *Schott.*

THERMOPSIS FABACEA, *DC. Prodr.* 2, *p.* 99. T. montana, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 388. Napa county, California, March; *Thurber.* Near the summit of the mountains east of San Diego, California, June; *Parry.*

OLNEYA TESOTA, *Gray, Pl. Thurb. p.* 328; *Torr. in Pacif. Railroad Expl.* 7, *p.* 10, *t.* 5. Ravines in the table lands on the lower Gila, often in company with Cercidium floridum; *Parry, Thurber.* Hills near Fort Yuma, California, January; *Schott.*

CERCIS OCCIDENTALIS, *Torr. in Gray, Pl. Lindheim.* 2, *p.* 177. Valley of the Devil's river, western Texas; *Bigelow.* Also in California. Mr. Blake informs me that the camels, lately imported into the United States, are very fond of the leaves of this plant.

HOFFMANSEGGIA JAMESII, *Torr. & Gray, Fl.* 1, *p.* 54; *Gray, Pl. Wright.* 2, *p.* 49. Sandy places near Fort Fillmore, and other places, in New Mexico, April—September; *Bigelow.*

HOFFMANSEGGIA CAUDATA, *Gray, Pl. Lindh.* 2, *p.* 179; *Pl. Wright.* 1, *p.* 54. On the lower Rio Grande, April; *Schott.* In our specimens there are from 2—4 pinnæ. The leaflets vary from 4 to 7 pairs in the lateral pinnæ, and from 9—15 (rarely only 7) in the terminal one. Sometimes they are scarcely a line in length.

HOFFMANSEGGIA MICROPHYLLA (n. sp.:) puberula; ramis elongatis virgatis; pinnis unijugis cum impari, lateralibus 10—12-foliolatis, terminali 14—20-foliolata, foliolis minutis oblongis eglandulosis; bracteis stipulisque caducis; racemo laxifloro elongato; legumine subfalcato acuto glandulis subsessilibus asperato. Sandy desert of the Colorado, California; *Schott.* Plant apparently two feet or more in height. Stem and branches green, minutely velvetty, pubescent. Lateral pinnæ 3—4 lines long, the terminal one nearly twice as long. Leaflets scarcely a line in length, pubescent. Calyx softly pubescent. Corolla yellow; the claws of all, and the back of the vexillum, somewhat glandular. Ovary thickly covered with pale disciform glands. Pods sessile, about ¾ of an inch long and nearly 3 lines wide, nearly straight on the upper suture, 4—6-seeded.

HOFFMANSEGGIA OXYCARPA, *Gray, Pl. Wright.* 1, *p.* 55. Vallies and hills of the San Pedro river, Texas, May; *Bigelow.*

HOFFMANSEGGIA STRICTA, *Benth. in Gray, Pl. Wright.* 1, *p.* 56. Sterile soils along the Rio Grande, from El Paso to Eagle Pass, Texas; also in New Mexico, April—July.

H. STRICTA β. DEMISSA, *Gray, l. c.* San Elceario; *Parry.* On the Pecos; *Schott.*

HOFFMANSEGGIA MELANOSTICTA, *Gray, l. c. p.* 54, (*adnot.*) Pomaria melanosticta, *Schauer.* On the Rio Grande below the cañon of San Carlos, October, (in flower and fruit;) *Parry.* Rinconada, and Monterey, Neuvo Leon; *Dr. Edwards.* Our plant differs somewhat from the

description of Schauer in Linnæa. There are only 2 or 3 pairs of leaflets, and the pod is 3—4-seeded. The vexillum, also, is destitute of glands and dots.

CASPARIA, *n. sp.?* Rocky hills near Santa Rosa, Chihuahua; *Parry.* An erect shrub, 2–3 feet high. Branches slender, flexuous, smooth. Leaflets distinct to the base, semiovate, very obtuse. 3-nerved, very smooth. Pods (old and imperfect) about 2 inches long and one-third of an inch wide

CERCIDIUM TEXANUM, *Gray, Pl. Wright.* 1, *p.* 58. Common on the Rio Grande from El Paso to Eagle Pass, forming dense thickets in many places.

CERCIDIUM FLORIDUM, *Benth. in Gray, l. c. (adnot.); Torr. in Pacif. R. Road Expl.* 6, *p.* 360, *t.* 3. On the Lower Gila and Colorado rivers; *Emory, Schott.* This is the Palo Verde of the Mexicans, and the Green-bark Acacia of American travellers.

CASSIA PUMILIO, *Gray, Pl. Lindh.* 2, *p.* 180, *& Pl. Wright.* 1, *p.* 59. Elm Creek valley, near Eagle Pass, and at the mouth of the Pecos; *Schott, Bigelow.*

CASSIA RŒMERIANA, *Scheele in Linnæa*, 21, *p.* 457; *Gray, Pl. Lindh. l. c.* Arroyo Zoquete and gravelly hills near Rock creek; July—September.

CASSIA BAUHINIOIDES, *Gray, Pl. Lindh. l. c., & Pl. Wright.* 1, *p.* 59. Sandy plains and rocky situations, Leon springs and along the Rio Grande from El Paso down to Eagle Pass; also in Chihuahua, Durango, and Sonora, April—August. Leaflets but a single pair in all our specimens. Near Presidio San Vincente Dr. Parry found a variety with the leaflets broadly ovate. The same form is in Mr. Wright's collection.

CASSIA LINDHEIMERIANA, *Scheele, l. c.; Gray, l. c.* Dry ravines near the Flounce mountains. Between the San Pedro and the Pecos; also along the Rio Grande, June, August. Arroyo del Pozo Verde; *Schott.*

CASSIA WISLIZENI, *Gray, Pl. Wright.* 1, *p.* 60, *& 2, p.* 50. Hills and rocky places. Cañon of Bostecillos, on the Rio Grande; August. *Parry, Bigelow.* San Bernardino, Sonora; June. *Thurber.* Leaflets sometimes 4 pairs, larger than in Wright's specimens. A neat and showy plant, well deserving of cultivation.

CASSIA WRIGHTII, *Gray, Pl. Wright.* 2, *p.* 50. On the Rio Mimbres, New Mexico; June, (flowers and fruit;) *Bigelow.* Sierra de los Tanos, Sonora; *Schott.*

CASSIA NICTITANS, *Linn.; Torr & Gray, Fl.* 1, *p.* 396. Comanche springs and Leon springs; *Bigelow.* Differs from the eastern plant in its narrower and more numerous seeded pods, and in the stipitate glands of the petioles; but it does not appear to be a distinct species.

CASSIA CHAMÆCRISTA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 395. Sandy places between Ringgold barracks and Laredo; June. *Schott.*

CASSIA CHAMÆCRISTOIDES, "*Collad. Mon. Cass. p.* 134." C. cinerea, *Cham. & Schlecht.* With the last; *Schott.*

CASSIA OBTUSIFOLIA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 394. Island of the Lost Rock, in the Lower Rio Grande; *Schott.*

PARKINSONIA ACULEATA, *Linn.; DC. Prodr.* 2, *p.* 486. Alluvions and prairies of the Lower Rio Grande, and hills of the Colorado, near Fort Yuma, California; *Schott.* Fort Duncan, Texas; *Dr. Edwards.* Between Reynosa and Matamoras, Mexico; *Dr. Gregg.* An ornamental prickly shrub, now cultivated or naturalized in most of the warmer parts of the world, but probably, as Alph. De Candolle thinks, of American origin. According to Mr. Schott it is valued by the Mexican Indians as a febrifuge and sudorific, and also as a remedy in epilepsy.

PARKINSONIA MICROPHYLLA, *Torr. in Pacif. R. Road Expl.* 4, *p.* 82: glabriuscula ramosissima,

ramulis (saepe?) in spinas abuentibus; foleis geminis vel teenis pinnatis, petiolo cammuni exalato supra canaliculato, foliolis 4—7-jugis minimis (1 lin. long.) suborbiculatis late ovalibusve obtusis subcoriaceis; staminibus petalis longioribus. On the Colorado, near Fort Yuma; *Schott*. This is an interesting addition to our Flora, being an undoubted native Parkinsonia, entirely distinct from P. aculeata, and much more nearly related to P. Africana, *Soud.* (*in Linnœa*, 23, *p.* 38.) We have seen no specimens showing the inflorescence but only a few loose flowers from the collections of Mr. Schott. From the fructiferous specimens it would appear that the racemes are fewer-flowered and the pedicels shorter than in P. aculeata. The flowers, too, are smaller, the stamens much more exserted, and the petals (except the vexillum) are ovate, not roundish, as in that species. The pods are nearly the same in both. These vary from 2 to several-seeded, and are constricted between the seeds with a very long acumination.

Cæsalpinia pulcherrima, *Swartz; Torr. & Gray, Fl.* 1, *p.* 397. Ures, Sonora, October; *Thurber*.

Algaroba glandulosa, *Torr. & Gray, l. c. p.* 399; *Gray, Pl. Wright.* 1, *p.* 60. Sandy soils along the Rio Grande and its tributaries and in the Mexican States. Common on the bottom lands of the Gila. This is the celebrated mesquite, so often noticed in the reports of western exploration. Dr. Gray (l. c.) suspects that it may be united (together with P. dulcis and P. Siliquastrum) to P. juliflora. It affords a gum nearly equal to gum arabic, of which it stated that large quantities have lately been sent to San Francisco from Mexico.

Strombocarpa pubescens, *Gray, Pl. Wright. p.* 60; *Torr. Pacif. R. Road Expl.* 6, *p.* 360, *t.* 4. Valley of the Rio Grande from New Mexico, 20 miles below San Elcearío; *Bigelow*. Bottom lands of the Rio Gila and R. Colorado. The *Screw-bean* or *Screw-mesquite* of American travellers and Tornillo of the Sonorians.

Strombocarpa cinerascens, *Gray, l. c. p.* 61, *adnot.* Boggy places, Fort McIntosh, and other places on the Lower Rio Grande, May, November; *Schott*. The thorns are variable in length, being sometimes longer, sometimes much shorter than the leaves. Pods like those of S. pubescens, except that they are a little thicker.

Neptunia lutea, *Benth. in Hook. Torr. Bot.* 4, *t.* 356. Painted Caves, and near Eagle Pass, western Texas, June; *Bigelow, Schott*. In our specimens the fruit is sessile, while it is stipitate in the Florida plant.

Desmanthus velutinus, *Scheele in Linnœa*, 21, *p.* 456; *Gray, Pl. Lindh.* 2, *p.* 183. Hills at the Copper Mines, August; *Bigelow*. Common near Eagle Pass; *Schott*.

Desmanthus Jamesii, *Torr. & Gray, Fl.* 1, *p.* 402; *Gray, Pl. Wright.* 2, *p.* 63. Gravelly hills along Rock Creek; and rocky places at the Copper Mines. July, (in flower,) August, (in fruit); *Bigelow, Parry*.

Mimosa fragrans, *Gray, Pl. Lindh.* 2, *p.* 182; *& Pl. Wright.* 1, *p.* 61. Head of the Rio San Pedro; *Bigelow*. Eagle Pass, April—June; *Schott*.

Mimosa Borealis, *Gray, Pl. Fendl. p.* 39, *& Pl. Wright. l. c.* Plains near Live Oak Creek, September, (in fruit); *Bigelow*.

Mimosa Lindheimeri, *Gray, Pl. Lindh.* 2, *p.* 181. Rocky and gravelly hills and ravines, July; *Bigelow*.

Mimosa dysocarpa, *Benth. in Gray, Pl. Wright*, 1, *p* 62. On the Cibolo of the Rio Grande and Rock Creek; also hills at the Copper Mines, July—August; *Bigelow*.

Mimosa malacophylla, *Gray, Pl. Lindh.* 2, *p.* 182, *adnot.*, *& Pl. Wright.* 1, *p.* 163. Rocky

hills near Santa Rosa, Chihuahua; *Bigelow*. Sometimes there are one or two short prickles or teeth on the margin of the pods.

M. MALACOPHYLLA var. GLABRA, *Gray*. La Blanca on the Lower Rio Grande; *Schott*. The same as No. 815 and 2235, *Berlandier*.

MIMOSA FLEXUOSA. *Benth. in Gray, Pl. Wright.* 1, *p.* 62. Hills near Rock Creek, July; *Bigelow*.

MIMOSA BIUNCIFERA, *Benth. Pl. Hartw. p.* 12; *Gray, Pl. Wright.* 2, *p.* 61. With the last, and at Eagle Springs. Mababi, Sonora, June; *Thurber;* Sierra del Pajarito; *Schott*.

MIMOSA STRIGILLOSA, *Torr. & Gray, Fl.* 1, *p.* 399. On the Lower Rio Grande, May; *Schott*.

MIMOSA BERLANDIERI (Gray, MSS. Habbasiæ Rubicaulium): "fruticosa erecta; ramis et interdum petiolis aculeis sparsis brevibus rectis armatis, junioribus puberulis setis brevioribus parce strigosis; stipulis ovato-subulatis; pinnis 4—6-jugis, costis subtus strigosis; foliolis 20—40-jugis linearibus acutiusculis glabellis obsolete 3—4-nervatis; capitulis pedunculatis racemoso-subpaniculatis; floribus tetrameris; calyce minimo truncato; legumine breviter stipitato oblongo-lineari nudo hirtello 8—10-articulato." Banks of the Lower Rio Grande, towards its mouth, November; *Schott*. Environs of Matamoras; *Berlandier*, (No. 3146.)

SCHRANKIA UNCINATA, *Willd. Sp.* 4, *p.* 1043? Stone-wreath Hills, on the Lower Rio Grande, April; *Schott*. The pods not being sufficiently mature, we cannot be certain of the species.

CALLIANDRA HUMILIS, *Benth. in Lond. Jour. Bot.* 5, *p.* 103; *Gray, Pl. Wright.* 2, *p.* 53. Near the Copper Mines, New Mexico, June—August; *Bigelow*.

CALLIANDRA RETICULATA, *Gray, l. c.* With the last; August.

CALLIANDRA HERBACEA, *Engelm. in Pl. Fendl. p.* 39; *Gray, Pl. Wright.* 1, *p.* 63. Low places on the Limpio, and near Rock Creek, July; *Bigelow*.

CALLIANDRA CHAMÆDRYS, *Engelm. l. c.; Gray, l. c.* On the more elevated parts of the Sierras of Sonora, March—July; *Thurber, Schott*.

CALLIANDRA (PORTORICENSIS, *Benth.* var.): glabriuscula, inermis; ramulis gracilibus; pinnis bijugis, foliolis 4—5-jugis oblongis obtusissimis sub remotis membranaceis basi inferiore subauriculatis ciliolatis, petiolis elongatis; stipulis lanceolatis striatis rigidis; pedunculis petiolo longioribus; calyce profunde 5-fido globoso corolla glabra dimidio breviore. Arroyo de los Samotas, Sierra Verde, Sonora, August; *Schott*. Peduncles 1½—2½ inches long. Flowers pale rose color. Filaments half an inch long. Pods not seen.

LUCÆNA RETUSA, *Gray, l. c. p.* 64. Hills and gravelly places between the San Pedro and the Rio Grande, July—September; *Bigelow, Schott*.

ACACIA WRIGHTII, *Benth. in Gray, l. c.* On the Rio Grande, Texas; and Sierra del Pajarito, Sonora, July—August; *Schott*.

ACACIA GREGGII, *Gray, l. c. p.* 65. Dry hills, El Paso and down the Rio Grande to the Great Cañon; also hills and mountains along the Gila to California, May—July.

ACACIA RIGIDULA, *Benth. in Lond. Jour. Bot.* 1, *p.* 504. Rocky hills, Leona. Also found by Dr. Edwards and Major Eaton near Monterey, Neuvo Leon. The slender spines are sometimes more than an inch long.

ACACIA RŒMERIANA, *Scheele in Linnæa*, 21, *p.* 456. Fort Inge, Texas; *Parry*. Mountains and rocky places, Presidio del Norte, August; *Bigelow*.

ACACIA TEPHROLOBA, *Gray, l. c. p.* 65. Hills on the San Pedro or Devil's river, September; (in fruit;) *Bigelow*.

ACACIA COULTERI, *Benth. l. c.; Gray, Pl. Wright.* 2, *p.* 53. Eagle Pass and plains, and plains near Zoquete Creek; *Bigelow.*

ACACIA FLEXICAULIS, *Benth.; Gray, l. c.* 1, *p.* 65, *adnot.* Monterey, Neuvo Leon, &c.; *Thurber.* This is clearly the same as Gregg's plant.

ACACIA CUSPIDATA, *Schlecht. in Linnæa*, 12, *p.* 513; *Gray, Pl. Wright.* 1, *p.* 66. A. hirta, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 404. A. Texensis, *Torr. & Gray, l. c.* Plains and dry places along the Rio Grande, and in New Mexico; also in Sonora; June—October. After a careful comparison of numerous specimens of the first and last species here quoted with an original specimen of A. Texensis, I unite the whole without hesitation.

ACACIA CONSTRICTA, *Benth. in Gray, Pl. Wright.* 1, *p.* 64. Hills along the Rio Grande, from El Paso to the Presidio del Norte; also near Tascata, and in Sonora; May—July. Sometimes the leaves have only 1 or 2 pairs of pinnæ; but such occur chiefly on very short branches or spurs. The leaves and young branches are strongly pubescent in specimens collected near the Presidio del Norte by Dr. Parry.

ACACIA SCHOTTII (n. sp.:) glabra; spinis stipularibus subulatis rectis; foliis fasciculatis unijugis; foliolis 3—5-jugis filiformi-linearibus alternis; legumine lineari complanato toruloso curvato, valvulis coriaceis. Near the Cañon of San Carlos, at the Comanche Crossing of the Rio Grande, September, (in fruit); *Parry.* Branches flexuous terete. Petiole below the fork one-third of an inch long. Pinnæ an inch in length. Leaflets 2 lines long, and scarcely ½ of a line wide, thick. Spines 2—3 lines long. Peduncles slightly bracteate in the middle. Stamens very numerous. Legume 2—3 inches long, and ½ of an inch wide, elevated on a short stipe, 6—9-seeded, curved into a semi-circle, or even a nearly complete circle. This is a very distinct species, but seems to be allied to A. constricta.

ACACIA FARNESIANA, *Willd.* A. Cavenia. *Hook. & Arn. Bot. Beechey, p.* 21; *Benth. Mimos. in Hook. Lond. Jour. Bot. l. c.* Common on the boundary from Texas to California.

"ACACIA TORTUOSA, *Willd. Sp.* 4, *p.* 1083, *Benth. Mimos. in Hook. Lond. Jour. Bot.* 1, *p.* 392. A. albida. *Lindl. Bot. Reg. t.* 1317. Vachellia Lindheimeri seu minor. *Engelm. MS. in herb. Gray.* Plains near Eagle Pass on the Rio Grande, and on hill sides, Santa Rosa, Chihuahua; *Bigelow.* Tamaulipas; *Berlandier.* In flower this species is readily mistaken for A. Farnesiana; but Dr. Engelmann had distinguished it even in that state. Flowering specimens have been confounded with A. Cavenia, which is only A. Farnesiana. The present species is well distinguished by its pod, which is elongated-linear, 3 to 5 inches long, narrow, nearly terete, moniliform, fleshy, and minutely tomentose; seeds uniserial, compressed, black. The corolla is longer than in A. Farnesiana. The heads and peduncles are nearly glabrous in our specimens."—*A. Gray.*

ACACIA? CRASSIFOLIUM, *Gray, Pl. Thurb. p.* 317. La Peña, Cohahuila; *Dr. Edwards, Thurber.*

PITHECOLOBIUM BREVIFOLIUM, *Benth. in Gray, Pl. Wright.* 1, *p.* 67. Rocky hills around the silver mines of Santa Rosa, Coahuila. January, (with fruit of the preceding season;) *Bigelow.*

ROSACEÆ.

PRUNUS (CERASUS) VIRGINIANA, *Linn. Sp.* 1, *p.* 473. Dry ravines near Camp Bache, New Mexico, and at the Copper Mines; July; in fruit.

PRUNIN CAPOLLIN, *DC. Prodr.* 2, *p.* 539, (sub Ceraso;) *Gray, Pl. Wright.* 2, *p.* 544. Sides of the Limpio mountain, Texas; *Bigelow.* Sierra del Pajaritos, &c., Sonora; *Schott, Capt. E. K. Smith.*

PRUNUS DEMISSA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 411, (sub Ceraso.) On the mountains east of San Diego, California, June, in flower; *Parry*. A shrub seldom more than from 4 to 8 feet high.

PRUNUS ILICIFOLIA, *Nutt. l. c.* (sub Ceraso,) *& N. Amer. Sylv.* 2, *p.* 16, *t.* 47; *Hook. & Arn. Bot. Beechey, p.* 340, *t.* 83. Near San Diego, and in other parts of California, May; *Parry, Thurber*. This ornamental species seldom attains a greater height than 8 or 10 feet. The pulp of the fruit is flesh color and rather thin, but palatable.

PRUNUS SUBCORDATA, *Benth. Pl. Hartw. p.* 308. Eastern slope of the Cordilleras of California, and near San Felipe. A straggling bush 4 to 5 feet high. Fruit sub-globose, half an inch in diameter, the pulp thin and disposed to separate into two valves.

PRUNUS MINUTIFLORA, *Engelm. in Pl. Lindh.* 2. *p.* 185 (sub Pruno); *Gray, Pl. Wright.* 1, *p.* 68. Gravelly places and ravines between Devil's River and the Rio Grande; also in Chihuahua; *Parry, Bigelow.*

NUTTALLIA CERASIFORMIS, *Torr. & Gray, in Bot. Beechey, p.* 336, *t.* 82, *& Fl.* 1, *p.* 412 Napa county, California, March—April; *Thurber*. San Luis Obispo, in the same State; the most southern station of this plant that has come to our knowledge.

SPIRÆA ARIÆFOLIA, *Smith, in Rees Cyclop.; Torr. & Gray, Fl.* 1, *p,* 416. Monterey, California, May; *Parry*.

SPIRÆA DUMOSA, *Nutt. in Hook. Lond. Jour. Bot.* 6, *p.* 217; *Torr. in Stansb. Rep. p.* 387, *t.* 4 Mountains near the Copper Mines, New Mexico, May, in flower, and August, in fruit; *Bigelow*.

SPIRÆA CÆSPITOSA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 418. Sides of steep and almost inaccessible rocks on the Rio Grande, about 25 miles below El Paso, in Chihuahua, June; *Bigelow*.

CERCOCARPUS PARVIFOLIUS, *Nutt. l. c. p.* 427; *Hook. Ic. t.* 323. C. betulifolius, *Nutt. l. c.* Valley of the Upper Rio Grande, and westward to California. Flowers in May and June, fruit matures in September. The limb of the calyx early breaks away from the tube, and is carried up, with the petals and stamens, on the elongated style, and sometimes remains there until the fruit is considerably grown.

COWANIA MEXICANA, *D. Don in Linn. Trans.* 14, *p.* 574, *t.* 22. C. Stansburyana, *Torr. in Stansb. Rep. p.* 386, *t.* 3. In various parts of Sonora and western New Mexico, April—June. My extensive series of specimens show that the two species here brought together are connected by intermediate forms.

COWANIA ARIÆFOLIA, *Torr. in Gray, Pl. Wright.* 2, *p.* 107. Crevices of calcareous rock on the Rio Grande above the mouth of Pecos, October, in flower and fruit; *Parry*.

ACÆNA PINNATIFIDA, *Ruiz & Pav. Fl. Per.* 1, *p.* 68, *t.* 104; *Torr. & Gray, Fl. p.* 430. (TAB. XIX.) Monterey, California, April; *Parry*.

ADENOSTOMA FASCICULATA, *Hook. & Arn. Bot. Beechey, p.* 139 *&* 338; *t.* 30. Dry sandy hills and along the base of mountains, San Diego and Monterey, May; *Parry, Thurber*. A thick-set straggling bush, 7—8 feet high.

ADENOSTOMA SPARSIFOLIA, *Torr. in Emory's Report, p.* 140. (TAB. XX.) Western slope of the Cordilleras of California, July; *Parry*. This species was first discovered by Major Emory on the same mountains, near Warner's Pass. Dr. Parry states, in his notes, that it is a shrub from 4 to 8 feet high; but Major Emory found some of it 30 feet high. The bark is reddish, and peels off in shreds. The leaves are solitary and alternate, narrowly linear (nearly half an inch long and half a line wide) sparsely dotted (as are the branchlets) with minute roundish glands. Flowers in rather loose terminal panicles. Pedicels very short. Calyx turbinate-

campanulate, with several lanceolate bracts at the base; 10-striate, 10-toothed; the teeth very obtuse. Stamens mostly 10, the filaments inserted on the outer crenulate margin of the disk, at the summit of the calyx-tube. Ovary and style as in A. fasciculata. Fruit not known. This seems to be a very distinct species. We have never received the plant except from the station just noticed.

FALLUGIA PARADOXA, *Torr. in Emory, Rep. p.* 139, *t.* 2; *Gray Pl. Fendl. p.* 41, *& Pl. Wright.* 1, *p.* 68. Sieversia paradoxa, *D. Don.* Ravines and rocky places along the Upper Rio Grande, and near the Copper Mines, New Mexico, April—June; the fruit ripe in August.

HORKELIA CUNEATA, *Lindl. Bot. Reg. sub fol.* 1997; *Torr. & Gray, Fl.* 1, *p.* 432. Near Monterey, California, April; *Parry.*

POTENTILLA PARADOXA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 437; *Lehm. Revis. Potent. in Nov. Act. Leopold-Cæs.* 23, (*suppl.*) *p.* 194, *t.* 62. Wet places on the Rio Grande, between El Paso and San Elceario, June, (flowers and fruit;) *Bigelow.*

POTENTILLA GLANDULOSA, *Lindl. Bot. Reg. t.* 1583; *Lehm. l. c. p.* 48. Monterey, California, May; *Parry.* Flowers ochroleucous.

POTENTILLA THURBERI, *Gray, Pl. Thurb. p.* 318; *Lehm. l. c. p.* 92. Around the Copper Mines of New Mexico, July; *Thurber, Bigelow.*

POTENTILLA ANSERINA, *Linn; Lehm. l. c. p.* 88. San Francisco and Monterey, California, April; *Thurber, Parry.*

FRAGARIA VESCA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 448. Pine woods near Monterey, April; *Parry.*

FRAGARIA CHILENSIS, *Ehrh.; Torr. & Gray, l. c.* Sand-hills near San Francisco, California, April; *Parry.*

RUBUS NEO-MEXICANUS, *Gray, Pl. Wright.* 2, *p.* 55. Sides of Ben Moore, near the Copper Mines, June, in flower and fruit; *Bigelow.* The peduncles are sometimes 3-flowered. Allied to R. trilobus, *Moc. & Ses.*

RUBUS TRIVIALIS, *Mich. & Fl.* 1, *p.* 296? Moist shady places, San Luis Obispo and San Diego, California; *Parry.* Mabibi, Sonora, June; *Thurber.*

RUBUS URSINUS, *Cham. & Schlecht, in Linnæa,* 2, *p.* 11; *Torr. & Gray, Fl.* 1, *p.* 456. New Almaden, California, March—April; *Thurber.*

RUBUS NUTKANUS, *Mocino; Torr. & Gray, l. c. p.* 450. Monterey, California, May; *Parry.*

ROSA GYMNOCARPA, *Nutt. in Torr. & Gray, l. c. p.* 461. (TAB. XXI.) San Diego, California, May; *Parry.* A variety with larger leaves occurs at the same place.

ROSA BLANDA, *Ait. Kew.* (*ed.* 1) 2, *p.* 202. Moist places between the Limpia and the Rio Grande, and westward to California; April—May.

AMELANCHIER CANADENSIS var. ALNIFOLIA, *Torr. & Gray, Fl.* 1, *p.* 473. Near the Copper Mines, New Mexico; *Thurber.*

PHOTINIA ARBUTIFOLIA, *Lindl. in Linn. Trans.* 13, *p.* 103, *& Bot. Reg. t.* 491; *Torr. & Gray, l. c.* Monterey, and Cordilleras of California.

VAUQUELINIA CORYMBOSA, *Corr. in Humb. & Bonpl. Pl. Æquin.* 1, *p.* 140, *t.* 40. Spiræa Californica, *Torr. in Emory, Rep. p.* 140. Sierra Verde, Sonora, July, in flower, *Schott.* High mountains near the Gila, November, in fruit; *Maj. Emory.* Dr. Parry's specimens accord with the description and figure of Humb. & Bonpl., except that the leaves are smaller and less deeply toothed. In the plant collected by Maj. Emory, the leaves are ovate-lanceolate and serrate.

LYTHRACEÆ.

NESÆA LONGIPES, *Gray, Pl. Wright.* 1, *p.* 68. Wet places along the Rio Grande, July to October.

NESÆA SALICIFOLIA, *H. B. K. Nov. Gen. & Sp.* 6, *p.* 192. Shore of the Rio Grande, from Ringgold Barracks down to the mouth of the river, September, (in flower and fruit); *Schott.*

LYTHRUM ALATUM, *Pursh, Fl.* 1, *p.* 334; *Torr. & Gray, Fl.* 1, *p.* 482. Common along the Rio Grande and westward to Sonora, April to September.

CUPHEA WRIGHTII, *Gray, l. c. p.* 56. Between Babocomori and Santa Cruz, Sonora, September.

AMMANNIA LATIFOLIA, *Linn. Sp.* 1, *p.* 119; *Torr. & Gray, Fl.* 1, *p.* 480. Guadaloupe, Chihuahua, October; *Thurber.*

AMMANNIA WRIGHTII, *Gray, l. c. p.* 55. Wet places in valleys of the Limpio mountains, July; *Bigelow.* Margin of water holes, Sonora, September; *Thurber.*

ONAGRACEÆ.

ZAUSCHNERIA CALIFORNICA, *Presl. Rel. Hænk.* 2, *p.* 28, *t.* 52; *Torr. & Gray, Fl.* 1, *p.* 486. Sonora, September; *Thurber.*

EPILOBIUM COLORATUM, *Muhl. in Willd. Enum.* 1, *p.* 411. Between the Limpio and the Rio Grande; also at the Copper Mines, June to July; *Bigelow.* Valley of the Mimbres; *Thurber.* Cañon of Guadaloupe, Sonora, April; *Capt. E. K. Smith.*

ŒNOTHERA BIENNIS, *Linn.; Torr. & Gray, Fl.* 1, *p.* 492. Along the Rio Grande, from New Mexico to Laredo. Var. HIRSUTISSIMA, *Gray, Pl. Fendl. p.* 43. Chihuahua; *Thurber.*

ŒNOTHERA JAMESII, *Torr. & Gray, Fl.* 1, *p.* 493; *Gray, Pl. Lindh.* 2, *p.* 189. Borders of Devil's river, Texas.

ŒNOTHERA SINUATA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 494. Near the Copper Mines, July; *Bigelow.*

ŒNOTHERA ALBICAULIS, *Nutt. Gen.* 1, *p.* 245; *Gray, Pl. Wright.* 1, *p.* 69 & 2, *p.* 56. Sand-hills along the upper Rio Grande, and valley of the Gila, common.

ŒNOTHERA CORONOPIFOLIA, *Torr. & Gray, Fl.* 1, *p.* 495. Banks of rivers, southern parts of New Mexico.

ŒNOTHERA ROSEA, *Ait.; DC. Prodr.* 3, *p.* 51. Valley of the Santa Cruz, Sonora, June; *Schott, Thurber.*

ŒNOTHERA MISSOURIENSIS, *Sims, Bot. Mag. t.* 1592; *Torr. & Gray, l. c. p.* 500. Valley of Devil's river, Texas, April; *Schott.*

ŒNOTHERA WRIGHTII, *Gray, Pl. Wright.* 2, *p.* 57. Rocky ravines near El Paso and Santa Barbara, April; *Bigelow, Thurber.*

ŒNOTHERA BRACHYCARPA, *Gray, Pl. Wright.* 1, *p.* 70; & 2, *p.* 57. Valley of the San Felipe, and near Frontera, western Texas, April; *Thurber, Bigelow.*

ŒNOTHERA TRILOBA, *Nutt.; Torr. & Gray, Fl.* 1, *p.* 499; *Gray, l. c.* Dry bed of Lake Gusman, northern Chihuahua, April; *Bigelow.*

ŒNOTHERA PRIMIVERIS, *Gray, Pl. Wright.* 2, *p.* 58. Sandy and gravelly places along the upper Rio Grande, and in northern New Mexico, March—April.

ŒNOTHERA MARGINATA, *Nutt., in Torr. & Gray Fl.* 1, *p.* 500. Santa Barbara, New Mexico; *Thurber.*

ŒNOTHERA SERRULATA, *Nutt.: Torr. & Gray, l. c., p.* 500. Western Texas, and in New Mexico, April to September.

ŒNOTHERA LAVANDULÆFOLIA, *Torr. & Gray, l. c.* Between Eagle Springs and Van Horn's well, Texas, June; *Bigelow.*

ŒNOTHERA HARTWEGI, *Benth. Pl. Hartw. p.* 1; *Gray, Pl. Wright.* 1, *p.* 72. Œ. Fendleri, *Gray, Pl. Fendl. p.* 45. On the Rio Grande and its tributaries, from El Paso to Eagle Pass; April—June.

ŒNOTHERA TENICOLA, *Gray, Pl. Wright.* 1, *p.* 71. Gravelly places neart he Limpio, July; *Bigelow.*

ŒNOTHERA CHAMÆNERIOIDES, *Gray, Pl. Wright.* 2, *p.* 58. Frontera and Cook's Spring, Texas, April; *Bigelow.* San Bernardino and Santa María, Chihuahua, March; *Perry.*

ŒNOTHERA BISTORTA, *Nutt., in Torr & Gray, Fl.* 1, *p.* 508. San Pasqual, California, May; *Thurber.*

ŒNOTHERA GAURÆFLORA, *Torr. & Gray, Fl. p.* 510. Valley of the Gila, Sonora, May; *Schott.* Dry bed of a river near Monterey, California; *Dr. Andrews.*

ŒNOTHERA CLAVÆFORMIS, *Torr. & Frem. in Fremont's* 2 *Rep. p.* 314; *Torr. in Pacific Railroad Expl.* 5, *p.* 360. Colorado desert; *Schott.*

ŒNOTHERA CARDIOPHYLLA, *Torr. l. c.* With the last; *Schott.*

ŒNOTHERA VINOSA, *Lindl. Bot. Reg. t.* 1880. San Diego, California, May; *Thurber.*

ŒNOTHERA VIMINEA, *Dougl.* With the last, May; *Thurber.*

GAURA VILLOSA, *Torr. in Ann. Lyc. New York,* 2, *p.* 200. Mountain ravines and moist places near Rock creek, July; *Bigelow.*

GAURA DRUMMONDII, *Torr. & Gray, Fl.* 1, *p.* 518. On the lower Rio Grande, October, (in flower and fruit) *Schott.*

GAURA SUFFULTA, *Engelm. in Pl. Lindh.* 2, *p.* 190; *Gray, Pl. Wright.* 1, *p.* 72. Western Texas on the lower Rio Grande; *Schott.*

GAURA PARVIFLORA, *Dougl., Torr. & Gray, Fl.* 1, *p.* 519. Western Texas and New Mexico; also in the valley of the Gila, May—July.

GAURA COCCINEA, *Nutt., Torr. & Gray, l. c.; Gray, Pl. Wright.* 1, *p.* 73. Organ mountains, New Mexico, and down the valley of the Rio Grande to Eagle Pass, west to Sonora, April—July.

STENOSIPHON VIRGATUS, *Spach.; Monog. Onagr. Torr. & Gray, Fl.* 1, *p.* 520. Central Texas; *Thurber.*

EULOBUS CALIFORNICUS, *Nutt. in Torr & Gray, Fl.* 1, *p.* 515. Valley of the Gila, May; *Schott.* San Pasqual, California; *Thurber.*

JUSSIÆA REPENS, *Linn. Mant. p.* 381; *Torr. & Gray, l. c. p.* 520. Southwestern Texas and Sonora, April to October.

LUDWIGIA NATANS, *Ell. Sk.* 1, *p.* 581. Western Texas, October; *Bigelow.* Ojo Caliente, Chihuahua; *Thurber.* A form with much smaller leaves than usual, was found in the Limpio river, by *Bigelow.*

PROSERPINACA PALUSTRIS, *Linn. Torr. & Gray, Fl.* 1, *p.* 528. Pedro Pinta, Texas, October; *Bigelow.*

MYRIOPHYLLUM HETEROPHYLLUM, *Michx. Fl.* 2, *p.* 191. Ojo Caliente, Chihuahua; *Thurber.*

LOASACEÆ.

CEVALLIA SINUATA, *Lag. Nov. Gen. & Sp. p.* 11, *t.* 1; *Gray, Pl. Wright.* 1, *p.* 74. Common on hill sides along the Rio Grande; also, in Sonora, May to October.

PETALONYX THURBERI, *Gray, Pl. Thurb. p.* 319. (TAB. XVII.) Valley of the Gila, May—June, *Thurber; Schott.*

EUCNIDE BARTONIOIDES, *Zucc.; Gray, Pl. Lindh.* 2, *p*, 191. Cañons of the Rio Grande below San Carlos, August—October; *Parry.* Rocky places, Howard's Springs; *Bigelow.* Ringgold Barracks; *Schott.*

MENTZELIA ALBICAULIS, *Dougl.; Torr. & Gray, Fl.* 1, *p.* 534. Rocky hills on the upper Rio Grande and its tributaries, also in Sonora, March to September. Mountains east of San Diego, California; *Parry.* The oily seeds are pounded and used by the Indians as an ingredient of their *Piñolé mantica*, a kind of cake.

MENTZELIA WRIGHTII, *Gray, Pl. Fendl. p.* 48. Mountain ravines, Rock Creek, July; *Bigelow.* Valley of San Bernardino, Sonora, April; *Capt. E. K. Smith.*

MENTZELIA MULTIFLORA, *Nutt. Pl. Gamb. p.* 180; *Gray, Pl. W[illegible] p.* 74. Hill sides along the Rio Grande, from El Paso downward to Laredo, April [illegible] July.

MENTZELIA OLIGOSPERMA, *Nutt. in Bot. Mag. t.* 1760; *Torr. & Gray, Fl.* 1, *p.* 533. Wet ravines on the Cibolo of the Rio Grande, July; *Bigelow.*

PASSIFLORACEÆ.

PASSIFLORA AFFINIS, *Engelm. in Gray, Pl. Lindh.*, 2, *p.* 233. Devil's river, Texas, October (in fruit); *Bigelow.*

PASSIFLORA TENUILOBA, *Engelm. l. c. p.* 192. High prairies and hill sides, Western Texas, along the Rio Grande, September, October; *Parry, Schott.*

PASSIFLORA FŒTIDA, *Linn. Amœn.* 1, *p.* 228, *t.* 19; *Sp. p.* 1359. Thickets, Eagle Pass, June; *Schott.* A variety which seems to be intermediate between P. fœtida, *Cavan.* and P. hibiscifolia, *Lam.*, having the leaves of the former and the pubescence of the latter. Mr. Schott found on the Sierra del Pozo Verde, in Sonora, a form with velvety pubescence, and almost 3-parted leaves, with the divisions more or less lobed and toothed.

PASSIFLORA MEXICANA, *Juss. Ann. Mus. p.* 108; *t.* 38, *DC. Prodr.* 3, *p.* 324. Tubac, Sonora; *Thurber.* Leaves glaucous, 2-lobed below the middle, the lobes moderately diverging, 1 to 1½ inch long from the bifurcation, marked near the base with a few round brownish glands. Flowers three-fourths of an inch in diameter, pale purple.

CUCURBITACEÆ.

SICYDIUM LINDHEIMERI, *Gray, Pl. Lindh.* 2, *p.* 194, *& Pl. Wright.* 1, *p.* 75. Presidio del Norte, July; *Parry.* Arroyos of the Limpia, *Bigelow.* Lower Rio Grande; *Schott.* Var. TENUISECTUM, *Gray, l. c.* Between the Leone and the Rio Grande; *Bigelow.* Mountains of Sonora; *Schott.*

CUCURBITA PERENNIS, *Gray, Pl. Lindh.* 2, *p.* 193. Plains between the Rio Grande and the Pecos, June—July; also at the Copper mines; *Bigelow.* Bottom lands of Devil's river, April to October; *Schott.* Grows in large patches; fruit the size and shape of a small orange.

CUCURBITA DIGITATA, *Gray, Pl. Wright.* 2, *p.* 60. Valleys among the mountains of Sonora, July (in flower;) *Schott.*

APODANTHERA? UNDULATA, *Gray, l. c.* Cañons of the Rio Grande, June; *Bigelow, Parry.* Santa Cruz, Sonora, June; *Schott, Thurber.* The Sonorians call the fruit of this plant *Melon de Cayota.*

CYCLANTHERA DISSECTA, *Arnott, in Hook. Jour. Bot.* 3, *p.* 280; *Gray, Pl. Wright.* 1, *p.* 75.

Alluvial borders of the Gila, May; *Schott.* Mountains and rocky places; Puerto de Paysano, Sonora, September (with flowers and young fruit); *Bigelow.*

ELATERIUM? WRIGHTII, *Gray, Pl. Wright. Fl.* 1, *p.* 61. Magdalena, Sonora, July; *Thurber.*

ELATERIUM? COULTERI, *Gray, l. c.* Hills near the Copper Mines, August, (in flower and fruit.) We fear not sufficiently distinct from the last. We have specimens which are almost equal in resemblance to both species.

CACTACEÆ.

The plants of this family, collected on the Boundary Survey, are described by Dr. Engelmann, in a separate article of this volume.

GROSSULACEÆ.

RIBES CALIFORNICUM, *Hook, & Arn.; Gray, in Bot. Whippl. Rep. p.* 88. Napa county, California, March; *Thurber.*

RIBES DIVARICATUM, *Dougl. in Hort. Trans.*, 7 *p.* 515; *Lindl. Bot. Reg. t.* 1559. In moist places, forming thick clumps, near Santa Barbara, California, March; *Parry.*

RIBES AUREUM, *Pursh, Fl.* 1, *p.* 164. Var. TENUIFLORUM. R. tenuiflorum, *Lindl. Bot. Reg. t.* 1274. Upper Rio Grande, and at the Copper Mines; also in Chihuahua and Sonora; March to April, Salinas river, California; *Parry.*

RIBES MENZIESII, *Pursh, Fl.* 2, *p.* 732. (TAB. XXIII.) Santa Barbara, California; *Parry.* A tall and handsome species.

RIBES SPECIOSUM, *Pursh, l. c.; Lindl. Bot. Reg. t.* 1557; *Torr. & Gray, Fl.* 1, *p.* 545. In ravines, from Monterey to San Diego, California, May; *Parry.* The most showy species of this genus. Its height is commonly from 6 to 8 feet.

RIBES MALVACEUM, *Smith in Rees Cyclop.; Torr. & Gray, Fl.* 1, *p.* 552. Common along the coast of California, particularly at Monterey and Santa Barbara, April; *Parry, Thurber.* A shrub with spreading branches, sometimes ten feet high. Flowers pale rose color; or in shady places, nearly white.

RIBES SANGUINEUM, *Pursh, Fl.* 1, *p.* 164; *Torr. & Gray, Fl.* 1, *p.* 551. San Pasqual, California, May; *Thurber.*

RIBES LEPTANTHUM, *Gray, Pl. Fendl. p.* 53, *& Pl. Wright.* 2, *p.* 63. Near the Copper Mines, and valley of the Mimbres, April; *Bigelow.*

CRASSULACEÆ.

SEDUM WRIGHTII, *Gray, Pl. Wright.* 1, *p.* 76. Hills and rocky places; Mount Carmel, Chihuahua, September and October; *Parry.* Mountains around the Copper Mines, and Puerto de Paysano; *Bigelow.*

SEDUM SPATHULÆFOLIUM, *Hook.; Torr. & Gray, Fl.* 1, *p.* 559. Rocky hills, Piñasquitas, California, May; *Thurber.*

SEDUM EDULE, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 560. Dry banks near the sea at San Diego, California; associated with Echeveria; *Parry.*

ECHEVERIA STRICTIFLORA, *Gray, Pl. Wright.* 1, *p.* 76. White rocks near Rock Creek, western Texas, July; *Bigelow.*

ECHEVERIA PULVERULENTA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 560. E. farinosa, *Lindl. in Lond. Hort. Jour.* 4, *p.* 292? Coronados Islands, California, May; *Thurber.*

ECHEVERIA LANCEOLATA, *Nutt. l. c.* (TAB. XXIV.) Dry clay banks near the sea, at San Diego, California, June; *Parry*. Coronados islands; *Thurber*.

SAXIFRAGACEÆ.

SAXIFRAGA PARRYI (n. sp.): caudice subterraneo tuberoso ovato; foliis radicalibus suborbiculato-cordatis incico-lobatis, lobis dentatis; venis subtus petiolisque pubescentibus; scapis nudis gracilibus; floribus paucis laxe paniculatis; calycibus campanulatis liberis, dentibus brevibus; petalis lanceolatis brevi unguiculatis, stylis ovario subæqualibus in fructu divergentibus. (TAB. XXV.) Dry hills near San Diego and San Luis Rey, California, November—December; *Parry*. Tuber about the size of a hazel-nut, fleshy. Leaves all radical, and withering away soon after the flowers appear, about an inch in diameter, slightly pubescent above; petiole nearly as long as the lamina. Scapes 4–8 inches high, commonly 2–4 from each tuber, a little pubescent. Flowers 4–7 in a loose panicle or cyme. Calyx marked with 10 strong dark brown nerves, the teeth triangular, rather obtuse, and about half the length of the tube. Petals white, nearly twice the length of the calyx teeth. Stamens 10; filaments subulate, the alternate ones rather shorter than the others. Carpels united below, rostrate and diverging above, pointed with the slender styles, which are as long as the beaks. Seeds dull, angularly 4-ribbed. A remarkable species, with the calyx and habit of a small Heuchera, but it is decandrous and the ovary is wholly free as well as 2-celled.

SAXIFRAGA VIRGINIENSIS, *Michx. Fl.* 1, *p.* 269? Cyme very few-flowered, but in other respects like the eastern plant. Near San Diego, California; *Parry*.

HEUCHERA MICRANTHA, *Dougl. in Bot. Reg. t.* 1302; *Torr & Gray, Fl.* 1, 579. Ravines near Monterey, California, May; *Parry*.

HEUCHERA RUBESCENS, *Torr. in Stansb. Rep. p.* 388, *t.* 5; *Gray, Pl. Wright.* 2, *p.* 63. Organ mountains, New Mexico, November, (in fruit;) *Bigelow*.

HEUCHERA PARVIFOLIA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 581, *Gray, l. c. p.* 64. Copper Mines, New Mexico, August; *Bigelow*.

LITHOPHRAGMA CYMBALARIÆ, *Torr. & Gray, Fl.* 1, *p.* 585. Shady ravines near Santa Barbara, California, March; *Parry*.

LITHOPHRAGMA HETEROPHYLLA, *Hook. & Arn.; Torr. & Gray. l. c.* Near Monterey, California, March—May; *Parry*. Napa Valley; *Thurber*.

LEPUROPETALON SPATHULATUM, *Ell. Sk.* 1, *p.* 370; *Torr. & Gray, l. c. p.* 390. Santa Cruz, Sonora, March; *Parry*.

FENDLERA RUPICOLA, *Engelm. & Gray, Pl. Wright. p.* 77, *t.* 5. Organ mountains, New Mexico, and rocky places along the Rio Grande, down to the Presidio, March—May.

PHILADELPHUS SERPYLLIFOLIUS, *Gray, Pl. Wright.* 1, *p.* 77. Mountains and rocky places on the Rio Limpio, Texas, and at the Copper Mines, June—July; *Bigelow*. Sonora, April; *Capt. E. K. Smith*.

UMBELLIFERÆ.

HYDROCOTYLE UMBELLATA, *Linn. Sp. p.* 234; *Torr. & Gray, Fl.* 1, *p.* 599. Rio San Antonio, Texas; *Schott*. Devil's river, September; *Bigelow*. Bachuachi, Sonora, June; *Thurber*.

HYDROCOTYLE NATANS, *Cyrill.; Torr. & Gray, l. c.* C. prolifera, *Kellogg, Proc. Calif. Acad. Nat. Sc.* 1, *p.* 15. Borders of brooks, Monterey, &c., California; *Parry*.

HYDROCOTYLE RANUNCULOIDES, *Linn. f.; Torr. & Gray. l. c.* Fronteras, Sonora, May; *Thurber*.

BOWLESII LOBATA, *Ruiz & Pav.*; *Torr. & Gray, l. c. p.* 601. Moist shady places, near San Diego and Monterey, California; March—April; and on the Rio Gila; *Parry.*

SANICULA MENZIESII, *Hook. & Arn. Bot. Beechey, p.* 347; *Torr & Gray, l. c. p.* 602. Ravines near Monterey, California, April; *Parry.*

SANICULA BIPINNATIFIDA, *Dougl. in Hook. Fl. Bor.-Am.* 1, *p.* 258, *t.* 92. White Oak plains north of San Luis Obispo, and in other parts of California, March—April; *Parry.*

SANICULA LACINIATA, *Hook. & Arn. Bot. Beech. p.* 347. S. nudicaulis, *Hook. & Arn. l. c.* Monterey, California; *Parry.*

SANICULA ARCTOPOIDES, *Hook. & Arn. l. c.*; *Hook. Fl. Bor.-Am.* 1, *p.* 258, *t.* 91. Monterey, California, April; *Parry.*

ERYNGIUM LEAVENWORTHII, *Torr. & Gray, Fl.* 1, *p.* 604. Plains and rocky places between Devil's river and the Rio Grande, September; *Bigelow.* Piedras Pintas, western Texas; *Schott.*

ERYNGIUM WRIGHTII, *Gray, Pl. Wright.* 1, *p.* 78. Western Texas, on the Rio Grande, June; *Schott, Bigelow.* Sonora, June—September; *Thurber, Capt. E. K. Smith.*

ERYNGIUM DIFFUSUM, *Torr. in Ann. Lyc. N. York,* 2, *p.* 207, *& in Marcy Rep. p.* 286, *t.* 6. On the lower Rio Grande, May; *Schott.*

BERULA ANGUSTIFOLIA, *Koch; Gray, Pl. Fendl. p.* 55, *& Pl. Wright,* 2, *p.* 65. Marshes of the Limpio, Texas; and at the Copper Mines, July, (in flower and fruit;) *Bigelow.* Tucson, Sonora, May; *Schott.*

LEPTOCAULIS ECHINATUS, *Nutt. in DC. Prodr.* 4, *p.* 107; *Torr. & Gray, Fl.* 1, *p.* 609. Plains between Fort Fillmore and the Organ mountains, and mountains near Lake Santa Maria, Chihuahua, April; *Bigelow.* On the lower Rio Grande; *Schott.* Sonora; *Parry.*

CICUTA MACULATA, *Linn.; Torr. & Gray, Fl.* 1, *p.* 610. Shady moist places on the Limpio and Mimbres, July; *Bigelow, Thurber.*

DAUCOSMA LACINIATUM, *Engelm. & Gray, Pl.* 2, *p.* 210. Western Texas, October, (in fruit;) *Thurber.* Copper Mines; *Bigelow.*

CYMOPTERUS MONTANUS, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 624; *Gray, Pl. Fendl. p.* 56; *& Pl. Wright.* 1, *p.* 79.

CYMOPTERUS FENDLERI, *Gray, Pl. Fendl. p.* 57? On the upper Rio Grande, Texas, and Chihuahua; *Bigelow, Parry.*

THASPIUM? MONTANUM, *Gray, Pl. Fendl. p.* 57, var. TENUIFOLIUM, *Gray, Pl. Wright.* 2, *p.* 65. At the Copper Mines, New Mexico, June, (in flower;) *Bigelow.*

PEUCEDANUM DASYCARPUM, *Torr. & Gray, Fl.* 1, *p.* 628. Southern California: the particular station not recorded; *Parry.* The fruit is nearly twice as large as in Douglas' original specimen, but in other respects his plant resembles ours.

PEUCEDANUM PARVIFOLIUM, *Torr. & Gray, l. c.* Pine woods near Monterey, California, April (in flower, and with nearly mature fruit); *Parry.* Specimens from the same place, collected by Major Wm. Rich, have ripe fruit, which is nearly orbicular, from the unusual breadth of the winged margins.

PEUCEDANUM FŒNICULACEUM, *Nutt. in Torr. & Gray, l. c.?* San Luis Rey, California; *Parry.* We cannot be certain of the species, for want of the fruit. The divisions of the leaves are broader than in the ordinary forms of this species.

DEWEYA ARGUTA, *Torr. & Gray, l. c. p.* 641. Near Santa Barbara; *Parry.* (TAB. XXVI.)

EURYPTERA LUCIDA, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 629. (TAB. XXVII.) Gravelly hills north of San Diego, California, March; *Parry.*

HERACLEUM LANATUM, *Michx. Fl.* 1, *p.* 166; *Torr. & Gray, l. c. p.* 632. Borders of rivulets near Monterey, California, May, (in flower); *Parry.*

DAUCUS PUSILLUS, *Michx.* var. SCABER, *Torr. & Gray, l. c. p.* 636.

OSMORHIZA OCCIDENTALIS, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 639. Pine woods, Monterey, California; *Parry.*

OSMORRHIZA BRACHYPODA, *Torr. in Jour. Acad. Nat. Sc. Phil. n. ser.* 2, *p.* 79. *Torr. Pl. Whippl. p.* 93. With the last; *Parry.*

APIASTRUM ANGUSTIFOLIUM, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 644. (TAB. XXVIII.) Dry grassy hills, San Luis Rey, California; *Parry.*

CORNACEÆ.

CORNUS PUBESCENS, *Nutt. in Torr. & Gray, Fl.* 1, *p.* 652 (sub var. C. sericea,) & *Sylv.* 3, *p.* 54. *Torr. in Bot. Whippl. Rep. p.* 95. San Luis Obispo and San Luis Rey, California; *Parry.* A shrub 10 to 12 feet high.

CORNUS NUTTALLII, *Audubon, Birds of Amer. t.* 367; *Torr. & Gray, l. c.; Nutt. Sylv.* 3, *p.* 51, *t.* 97. Monterey, California; *Parry.*

CAPRIFOLIACEÆ.

LONICERA DUMOSA, *Gray, Pl. Wright.* 2, *p.* 66. Hills at the Copper Mines, New Mexico; June, (in flower); and on the Limpio, July, (in fruit); *Bigelow.* Hills near the Mimbres, May; *Thurber.* Santa Cruz mountains; Sonora; *Capt. E. K. Smith.* "A luxuriant vine." Corolla pale greenish yellow, ringent, about three-fourths of an inch long, the tube slender, not gibbous. Filaments smooth, except at the base. Stylo hairy. Except in the pubescence I see little to distinguish this from L. albiflora.

LONICERA INVOLUCRATA, *Banks; Torr. & Gray, Fl.* 2, *p.* 9. Monterey and other parts of California, April; *Parry, Thurber.* Stem 6 to 8 feet long, usually reclining on other plants. Leaves somewhat persistent. Flowers red and orange. Berries black.

LONICERA SUBSPICATA, *Hook. & Arn. Bot. Beechey, p.* 349; *Torr. & Gray, l. c.* (TAB. XXIX.) Bushy places on the mountains east of San Diego, California, June; *Parry.* Plant 3 to 4 feet high. Flowers yellowish.

SYMPHORICARPUS MOLLIS, *Nutt. in Torr. & Gray, Fl.* 2, *p.* 4. Woods near Monterey, California, April; *Parry.*

SYMPHORICARPUS ROTUNDIFOLIUS, *Gray, Pl. Wright.* 2, *p.* 66. Organ mountains, New Mexico; *Parry.* Hills at the Copper Mines, August, (flowers and fruit); *Bigelow.* A form with perfectly smooth and glaucous leaves was found near the Mimbres by Dr. Bigelow.

SAMBUCUS GLAUCA, *Nutt. in Torr. & Gray, Fl.* 2, *p.* 13. Var. foliis anguste lanceolatis, *Gray, Pl. Wright. l. c.* Sides of Ben Moore, near the Copper Mines, June; *Bigelow.* Not very distinct from the next.

SAMBUCUS MEXICANA, *Presl; DC. Prodr.* 4, *p.* 323; *Gray, Pl. Wright. l. c.* Banks of the Rio Grande, near El Paso, where it becomes a low tree, 12 inches in diameter at the base; *Bigelow.* Near Monterey, California, sometimes 25 feet high, August; *Parry.* Mabibi, Sonora; *Thurber.*

RUBIACEÆ.

GALIUM APARINE, *Linn. Sp. p.* 108. Sonora, June; *Thurber.*

GALIUM ASPERRIMUM, *Gray, Pl. Fendl. p.* 60. Wet ravines, Organ mountains, New Mexico, April; *Bigelow.* Annual. Leaves 6 to 8 in a whorl. Not very distinct from G. Aparine.

GALIUM CALIFORNICUM, *Hook. & Arn. Bot. Beech. p.* 340; *Torr. & Gray, Fl.* 2, *p.* 20. Pine woods near Monterey, California; *Parry.*

GALIUM PROSTRATUM, *Gray, Pl. Wright.* 2, *p.* 67. Rocky hills, El Paso, April.

GALIUM MICROPHYLLUM, *Gray, Pl. Wright.* 1, *p.* 81. Rocky places and sides of mountains along the upper Rio Grande, and at the Copper Mines, April.

GALIUM MULTIFLORUM, *Nutt. in Torr. & Gray, Fl.* 2, *p.* 21. San Diego, California; *Thurber.*

GALIUM WRIGHTII, *Gray, Pl. Wright.* 1, *p.* 80. Barro mountains, and Mountains of Mimbres; also on the Rio Grande, 70 miles below El Paso. The upper leaves, and sometimes the lower also, are merely scabrous, and not hairy.

CRUCIANELLA ANGUSTIFOLIA, *Linn.*; *Torr. & Gray, Fl.* 2, *p.* 31. Valley of the Rio Grande and westward to California, June—August.

BOUVARDIA HIRTELLA, *H. B. K. Nov. Gen. & Sp.* 3, *p.* 384; *Gray, Pl. Wright.* 1, *p.* 80. Cañons of the Rio Grande, June—July; *Parry, Bigelow.*

OLDENLANDIA ANGUSTIFOLIA, *Gray, Pl. Wright.* 2, *p.* 68. Rocky places along the Rio Grande and its tributaries, from El Paso downward, June—August Sonora; *Thurber.* An extremely variable species.

OLDENLANDIA ACERosa, *Gray, Pl. Wright. l. c.* Hedyotis acerosa, *Gray, Pl. Wright.* 1, *p.* 81. Dry hill-sides, Devil's river and along the Rio Grande, September—October.

OLDENLANDIA RUBRA, *Gray, l. c.* Hedyotis rubra, *Cham.* Hills at the Copper Mines, June; *Bigelow.*

OLDENLANDIA HUMIFUSA, *Gray, l. c.* Hedyotis humifusa, *Gray, Pl. Lindh.* 2, *p.* 216. Sandy hills, Western Texas; *Bigelow.*

DIODIA TERES, *Walt. Fl. Car. p.* 87; *Torr. & Gray, Fl.* 2, *p.* 29. On the lower Rio Grande; *Schott.*

VALERIANACEÆ.

VALERIANA EDULIS, *Nuttall. App. Frendl. Journ. ed.* 2, *p.* 2; *Torr. & Gray, Fl.* 2, *p.* 47. Hills at the Copper Mines, April, May; *Bigelow.*

VALERIANA MICRA, *Nutt. in Torr. & Gray, Fl. l. c.*; *Gray, Pl. Fendl. p.* 61. V. dilata, *Torr. & Gray, l. c.* Six miles west of the Copper Mines, April, May; *Bigelow.*

PLECTRITIS CONGESTA, *Lindl.*; *DC. Prodr.* 4, *p.* 631. Monterey and east of San Diego, California, April; *Parry.*

COMPOSITAE, (by A. GRAY.)

VERNONIA JAMESII, *Torr. & Gray, Fl.* 2, *p.* 58; *Gray, pl. Wright*, 1, *p.* 82, *& 2, p.* 69; *& in Bot. Whipp. Rep. R. R. Surv. p.* 95. Common in western Texas.

VERNONIA LINDHEIMERI, *Gray & Engelm., Pl. Lindh.* 2, *p.* 217. Southern Texas.

PECTIS ANGUSTIFOLIA, *Torr. in Ann. Lyc.; Gray, Pl. Wright, l. c., etc.* Pectidopsis angustifolia, *DC.* Dry hills, western Texas to the Copper Mines, New Mexico, etc., and south to the Rio Grande. According to Mr. Thurber, the fresh plant exhales the odor of lemon balm.

PECTIS FILIPES, *Harv. & Gray, in Pl. Fendl. p.* 62; *Gray, Pl. Wright*, 2, *p.* 69. Gathered by all the collectors; apparently common from the Rio Grande to Chihuahua and western Sonora.

PECTIS PAPPOSA, *Harv. & Gray, l. c.* This has now been traced nearly across the continent, from Presidio del Norte (*Bigelow, Parry, etc.*) to the Gila and Cocospera, (*Schott, Thurber, etc.*)

PECTIS LONGIPES, *Gray, Pl. Wright*, 2, *p.* 70. Santa Cruz, Sonora, and vicinity; found by all the collectors. Berlandier collected it in Nuevo Leon; it is No. 3159 of my distribution of his *reliquiæ.*

PECTIS IMBERBIS, *Gray, l. c.* Besides Wright's specimens, gathered on the Sonoita, Sonora, from which this remarkable species was characterized, it was also found at Janos, Chihuahua, and elsewhere by Schott.

PECTIS PROSTRATA, *Cav.; Gray, Pl. Wright*, 1, *p.* 83. New Mexico and Sonora; *Wright, Thurber.*

PECTIS TENELLA, *DC. Prodr.* 5, *p.* 99. Rio Coleto, Texas, *Thurber.* It was gathered by Berlandier at Laredo, and between the Rio Grande and the Nueces, and is No. 599, 985, 2009, and 2415 of the American distribution.*

ISOCARPHA OPPOSITIFOLIA, *R. Br.; DC. Prodr.* 5, *p.* 107. On the lower Rio Grande; *Schott, etc.* A congener of Dunantia, *DC.*, as Mr. Bentham has shown, (in *Bot. Voy. Sulphur.*) He has indicated the practical difficulties in the nomenclature of the two genera.

TRICHOCORONIS RIVULARIS, *Gray, Pl. Fendl. p.* 56. Piedra Pinta Creek, Texas. *Wright, Parry.*

STEVIA CANESCENS, *Benth. Pl. Hartw. p.* 19 (an *H. B. K.?*) *Gray, Pl. Wright*, 2, *p.* 71. A smoothish form, gathered both in New Mexico and Santa Cruz, Sonora, by *Wright & Thurber.*

STEVIA SALICIFOLIA, *Cav. Ic. t.* 354.; Lower Rio Grande; *Parry.* Pappus either 1-2-aristate, or else short and awnless, where it apparently passes into S. angustifolia, *H. B. K.*

STEVIA MICRANTHA, *Lag. Nov. Gen. & Sp. p.* 27. S. macella, *Gray, Pl. Wright*, 2, *p.* 70. Cobre (Copper Mines,) New Mexico; *Wright.* This being the same as a plant collected by Schaffner on Chepultepec, and kindly communicated to me by Dr. Schultz, the distinguished investigator of Compositæ, under the name of S. micrantha, I do not hesitate to restore that name, although the specimens do not altogether accord with Lagasca's brief character.†

*PECTIS BERLANDIERI, *DC. l. c.* (between Tantoyuca and Tampico, 732, 2152; San Fernando, Cohahuila, 1537, 3037, *Berlandier.*) has not yet been re-discovered. The setae of the pappus, both of the disk and ray, vary from three to six.

† In the portion of the collections of Berlandier, until now undistributed, occurs the following:

STEVIA BERLANDIERI (sp nov.): fruticosa, fere glabra; foliis oppositis ovatis obovativve obtusis in petiolum longum contractis basi triplinerviis crenato-subserratis crassiusculis, summis parvis spathulatis integerrimis; corymbo polycephalo pedunculato; capitulis brevissime pedicellatis capitato-congestis; involucri squamis atomiferis subacutis; achenils glaberrimis; pappo exaristato e squamis truncatis laceris coroniformi-subconcretis.

In the mountains near San Carlos, Tamaulipas; Berlandier, No. 3160. Mountains near Saltillo; *Gregg*, No. 224. Suffruticose, a foot or two high, leaves half an inch to an inch long, with a petiole of 1½—6 lines in length, smooth and glabrous, nearly veinless except the triple ribs at the base. Heads 3½ or 4 lines long, including the flesh-colored or whitish corolla.

CARPHOCHAETE BIGELOVII, *Gray, Pl. Wright*, 1, *p.* 89, 2, *p.* 71. New Mexico to Santa Cruz, Sonora; *Bigelow, Wright, Parry.* Sierra San Luis; *E. K. Smith.*

CARMINATIA TENUIFLORA, *DC. Prodr.* 7, *p.* 267; *Deless. Ic. Sel.* 4, *t.* 99; *Gray, l. c.* Copper Mines to Western Sonora.

KUHNIA EUPATORIOIDES, *Linn.* Narrow leaved forms, mostly var. GRACILLIMA, which abounds in New Mexico and Sonora, extends far into Mexico, and perhaps is K. rosmarinifolia.

LIATRIS PUNCTATA, *Hook. Fl. Bor.-Am.* 1, *p.* 306, *t.* 105. L. mucronata, *DC.* Mountains of the Limpia, and Salveto Creek, Texas; *Bigelow, Parry.*

CARPHEPHORUS JUNCEUS, *Benth. Bot. Sulph., p.* 21. Diluvial banks of the Colorado of the West, in dry and sandy beds of ravines; *Schott.*

PEUCEPHYLLUM, Nov. Gen. Eupatoriacearum.

Capitulum pluri-(10–16)-florum. Involucrum circiter 12-phyllum, disco brevius, laxum; phyllis vix biseriatis lineari-subulatis, inferne carinato-concavis margine tenuiter scariosis, superne foliiformibus. Receptaculum planum nudum. Corollæ longe cylindricæ, fauce non ampliatæ, 5-dentatæ, dentibus ovatis patentibus. Styli rami lineares, plano-convexi, obtusissimi, prorsus minutim glandulosi. Achenia haud matura subturbinata, teretia, hirsutissima. Pappus capillaris, setis rigidulis pluriserialibus valde inaequalibus denticulatis, longioribus corollam subaequantibus. Fruticulus ramosus, glanduloso-viscidulus; ramis monocephalis usque ad apicem foliosis; foliis acerosis punctatis alternis; floribus lutescentibus.

PEUCEPHYLLUM SCHOTTII.—Diluvial banks of the Colorado, in Sonora; February; *Schott.* Stems a span high, loosely branched. Leaves crowded, an inch or less in length, filiform, obtuse, glabrous, but glandular when young and more or less glutinous, strongly glandular-punctate. Head cylindraceous, half an inch long. Scales of the involucre obscurely one-nerved, the alternate and exterior ones rather smaller than the others. Corolla glandular at the summit. I know of no published genus to which this manifestly Eupatoriaceous plant is particularly allied. The name alludes to the acerose, fir-like foliage.

BRICKELLIA OLIGANTHES, *Gray, Pl. Wright*, 1, *p.* 84, & 2, *p.* 71. Santa Cruz, Sonora; *Wright, Thurber.*

BRICKELLIA VERONICÆFOLIA, *Gray, l. c.* Sonora; *Schott;* the habitat not recorded. This is an abundant species in Northern Mexico. It is distributed under eight different numbers in Berlandier's collection.

BRICKELLIA LACINIATA, *Gray, Pl. Wright*, 1, *p.* 87. Bachimba; *Thurber.* Organ mountains; *Bigelow.* On the Rio Grande; *Parry.* Dr. Schultz, in Seemann's *Botany of the Herald*, p. 301, has applied to this species the name of B. dentata, *Schultz, mss.*, supposing it to be De Candolle's Clavigera dentata, having overlooked my statement, in *Pl. Wright*, 1, p. 83, that the plant of De Candolle is B. Riddellii, and that the present species was not described in De Candolle's Prodomus. It is 1365 and 1783 of Berlandier's collection.

BRICKELLIA SIMPLEX, *Gray, Pl. Wright*, 2 *p.* 73. Babocomori to Santa Cruz, Sonora. At Bufotillo Ranch, Dr. Bigelow gathered specimens of a Brickellia with the foliage of B. simplex, and with a similar involucre, but the heads are small and more numerous.

BRICKELLIA WISLIZENI, *Gray, Pl. Fendl. p.* 64, & *Pl. Wright, l. c.;* Santa Cruz; Sonora; *Bigelow, Wright, &c.*

BRICKELLIA BETONICÆFOLIA, *Gray, Pl. Wright*, 2, *p.* 72. Cobre, etc., New Mexico; *Wright, Bigelow;* var. HUMILIS. Between Babocomori and Santa Cruz, Sonora; *Thurber, Wright.*

BRICKELLIA CYLINDRACEA, *Gray, Pl. Lindh.* 2, *p.* 218, & *Pl. Wright, l. c.* Western Texas, the Rio Grande near Eagle Pass, etc.; *Bigelow, Parry.*

BRICKELLIA RIDDELLII, *Gray, l. c.* Southern and western Texas, where it abounds.

BRICKELLIA WRIGHTII, *Gray, Pl. Wright*, 2, *p.* 72. Cobre, etc., New Mexico; *Wright.* Santa Cruz, Sonora; *Thurber.*

BRICKELLIA TENERA, *Gray, l. c.* Near Santa Cruz, Sonora, in a mountain ravine; *Wright.*

BRICKELLIA FLORIBUNDA, *Gray, l. c.* With the last, and also on the San Pedro, Sonora; *Wright.*

BRICKELLIA RENIFORMIS, *Gray, Pl. Wright*, 1, *p.* 86. Punto de Peysano; *Bigelow.*

BRICKELLIA BACCHARIDEA, *Gray, l. c.* Cobre, New Mexico; *Bigelow.*

BRICKELLIA GRANDIFLORA, *Nutt.*; *Torr. & Gray, Fl. l. c.* Cobre, New Mexico; *Bigelow, Wright.*

EUPATORIUM PARRYI (sp. nov): glanduloso-hirsutum, ramosum; foliis alternis nunc oppositis cordatis acutis grosse inciso-crenatis membranaceis subtriplinerviis venosis; petiolo elongato marginato; corymbis circiter 5-cephalis; pedunculis gracilibus; capitulis circiter 20-floris cylindraceis, squamis imbricatis triseriatis lanceolatis striatis aristato-acuminatis extus pubescentibus; acheniis ad angulos hirtellis.—Sierra de Carmel, near the Rio Grande, Chihuahua; October; *Parry.* Branches of an herbaceous species, apparently of a diffuse habit, which has the involucre and habit of a *Brickellia* (but the achenia are pentangular without intermediate striæ,) or of an *Ooclinium*, but the receptacle is flat. Leaves about an inch in length and breadth, deltoid-cordate, beset with a sparse and short pubescense or glabrate. Petioles 6 to 8 lines long, with narrow decurrent margins, hirsute with glandular or viscid hairs, like the stem, peduncles, etc. Peduncles minutely bracteolate. Heads half an inch long. Scales of the involucre green, lucid, appressed, strongly striate, tapering, especially the inner ones, into a slender short awn. Flowers apparently ochroleucous. Achenia 2 lines long, with a conspicuous basilar callus, slender. Pappus white, scabrous.

EUPATORIUM BIGELOVII (sp. nov): cinereo-pubescens, ramosum; foliis oppositis ovato-lanceolatis acutis integerrimis breviter petiolatis a basi rotundata tri-quinquenervatis supra glabratis subtus tomentosis; capitulis ternis quinisve ad apicem ramulosum brevi-pedicellatis 20–30-floris; involucro turbinato cinereo-tomentoso; squamis pluriseriatim imbricatis striatis, acutis, exterioribus ovatis oblongisve, interioribus lanceolatis seu linearibus purpurascentibus; acheniis secus angulos scabridis.—On the Gila, Sonora; *Parry.* Apparently an upright herbaceous plant, also with much the aspect of a Brickellia, but with the characters of Eupatorium. Leaves 2 or 3 inches long, thin, the larger an inch or more in width near the base, thence tapering to an acute point. Petioles 3 lines long. Heads half an inch long. Scales of the turbinate and tomentose involucre rather loosely imbricated in 5 or 6 series, the exterior successively shorter and broader. Flowers purplish. Pappus tinged with purple or brownish. Achenia a line and a half long.*

* EUPATORIUM SPINACIÆFOLIUM is the name which must apparently be borne by Bulbostylis spinaciæfolia, *DC. Prodr.* 5, *p.* 139, since it has pentagonal achenia and is a true Eupatorium. The species is founded on Berlandier's Nos. 764 and 2184 (Amer. distrib.) My specimens have only upper leaves, few of which are much hastate.

EUPATORIUM SCHIEDEANUM, *Schrad.*; *DC. Prodr.* 5, *p.* 159. (E. multinerve, *Benth.* E. Schiedeanoides, *Schultz, Bip.*:) var. GROSSE-DENTATUM. E. Sonorae, *Gray, Pl. Wright*, 2, *p.* 74. Mountain ravine near Santa Cruz, Sonora; *Wright.* Lower Rio Grande, Texas, near Ringgold's Barracks, etc.; *Schott.* The latter is a more diffuse and loosely flowered form, approaching E. paniculatum, *Schrad.*, in the inflorescence, but not in the leaves. The form with dense corymbs which comes from southern Mexico, Costa Rica, etc., Dr. Schultz has ascertained to be Lessing's E. pycnocephalum, a name not very appropriate for our forms nor for the specimens of Berlandier. The plant of the Rio Grande is said by Mr. Schott to exhale a moschate odor.

EUPATORIUM BERLANDIERI, *DC. Prodr.* 5, *p.* 167. E. ageratifolium β? Mexicanum, *DC. l. c. p.* 173. E. ageratifolium, var. Texense and var. herbaceum, *Gray Pl. Lindh. & Pl. Wright.* Various forms from southern Texas to the mountains near Santa Cruz, Sonora, (the nearly herbaceous state.) In Berlandier's *reliquiæ* distributed by me, this occurs under the numbers 762 and 2182, (between Victoria and Tula,) and 756, 2176, (between Tula and Tampico;) also from San Carlos, Tamaulipas, 3164. These all belong to one species, and the difference in the length of the pappus remarked by De Candolle is inconstant. The name of E. Berlandieri had best be retained for the species, at least until it is identified with the Cuban species.

EUPATORIUM WRIGHTII, *Gray, Pl. Wright*, 2, *p.* 87. New Mexico; *Wright.*

EUPATORIUM SOLIDAGINIFOLIUM, *Gray, l. c.* New Mexico; *Wright*, &c.

EUPATORIUM SEROTINUM, *Michx.* San Pedro river, western Texas; *Bigelow.*

EUPATORIUM CONYZOIDES, *Vahl. Symb.* 3, *p.* 96. Lower Rio Grande; *Schott.* Rocky ravines, near Santa Rosa; *Bigelow.* Mr. Trecul gathered this at the mouths of the Mississippi. De Candolle's Mexican stations are from Berlandier's collections, in which it occurs under numbers 1384, 2210, 2355, etc. The original colored drawing (in my possession) for the plate in Schrank's *Pl. Rar. Hort. Monac.*, *t.* 85, represents the flowers as white or whitish.*

CONOCLINIUM CŒLESTINUM, *DC. Prodr.* 5, *p.* 135. Rio Grande, near Laredo, *Schott.*

CONOCLINIUM BETONICUM, *DC. l. c.* Lower Rio Grande, *Schott.* A nearly glabrous form, with hastate-oblong and very obtuse leaves. Also a remarkable and doubtful form, with thin, glabrous, and entire ovate leaves from near the mouth of the Pecos. Perhaps the species, which seems to be polymorphous, likewise includes C. Hartwegi, *Walp.*, the Eupatorium Hartwegi, *Benth. Pl. Hartw.*

CONOCLINIUM DISSECTUM, *Gray, Pl. Wright*, 1, *p.* 88. From the lower Rio Grande to the borders of Sonora; found by all the collectors. It is singular that this does not occur in Berlandier's collection.

MIKANIA SCANDENS, *Linn.* Southern Texas, *Schott.* &c.

CORETHROGYNE INCANA, *Nutt.* (excl. syn.) San Diego, California; on hills; *Parry.* Probably this is no more than a state of C. Californica, without chaff on the receptacle.

CORETHROGYNE FILAGINIFOLIA, *Nutt.; Torr. & Gray, Fl.* 2, *p.* 98. There is a great deal of confusion in the description and synonymy of this and C. tomentella in the Flora of North

* EUPATORIUM AZUREUM, *DC. l. c. p.* 168, No. 1380 of Berlandier's collection, was also gathered by Dr. Gregg at Monterey, in better specimens. The heads are 30–40-flowered; the corolla purplish, according to Gregg; and the leaves are broadly deltoid. The species is allied to E. deltoideum, but the leaves are not hastate, the heads are shorter and smaller, the involucre more biseriate, its outermost scales broader, and the achenia nearly glabrous.

America and elsewhere, which it is now hardly worth while to clear up in detail, since it is evident that the two really belong to one polymorphous species, which includes Bentham's C. virgata and C. obovata also. The plant has a persistent base, and blossoms at various seasons; the wool is either permanent or deciduous, etc. Should my conjecture about C. incana prove true, the known forms of the genus may be reduced to two species, C. Californica and C. filaginifolia.

MACHÆRANTHERA CANESCENS, *Gray, Pl. Wright.* 1, *p.* 89, &c. Along the boundary everywhere, from the upper part of the Rio Grande to the Gila, &c.

MACHÆRANTHERA TANACETIFOLIA, *Nees. Ast. p.* 224; *Gray, l. c.* From the Pecos to Sonora, etc.; in various forms.

MACHÆRANTHERA PARVIFLORA, *Gray, l. c.* Plains and mountains, southern borders of New Mexico and adjacent parts of Sonora; also on the Gila; *Bigelow, Parry, Wright, Thurber.*

PSILACTIS ASTEROIDES, *Gray, Pl. Fendl. p.* 72. Along the Rio Grande, from Presidio to El Paso, etc., and in Sonora.

ASTER MULTIFLORUS, *Ait.* Common from the lower Rio Grande to the Gila, etc. A. hebecladus and A. scoparius, *DC.*, are founded on exactly the same thing in Berlandier's collections.

ASTER SIMPLEX, *Willd.* Sonora; *Wright.* On the Mimbres, New Mexico; *Bigelow.*

ASTER CARNEUS, *Nees.* A. cœrulescens, *DC. Prodr.* 5, *p.* 235. Western Texas; *Thurber.* On the Pecos; *Bigelow.*

ASTER PUNICEUS, *Linn.;* var. VIMINEUS, *Torr. & Gray.* Mimbres; *Bigelow.* Sierra de los Animos; *Wright.*

ASTER LONGIFOLIUS, *Lam.* On the Mimbres; *Wright.*

ASTER NOVI-BELGII, *Linn.* Also on the Mimbres, etc.; *Wright, Bigelow.*

ASTER SPINOSUS, *Benth. Pl. Hartw. p.* 20. Along the Rio Grande, below El Paso, to its mouth.

ASTER DIVARICATUS, *Nutt.* From the lower Rio Grande to Sonora.

ASTER ANGUSTUS, *Torr. & Gray, l. c.* Sand bars of the Rio Grande, below Doña Ana; *Wright, Bigelow.* Probably brought down the river from the Rocky mountains.

ASTER PAUCIFLORUS, *Nutt.; Gray, Pl. Wright,* 2, *p.* 76. Subsaline soil, west of the Chiricahui mountains and Santa Cruz, Sonora; *Wright.*

ASTER BLEPHAROPHYLLUS, *Gray, Pl. Wright, l. c.* Subsaline soil, Los Playos Springs, New Mexico; *Wright.*

ASTER SONORÆ, *Gray, Pl. Wright, l. c.* In the same region as the last two species.

ASTER CHILENSIS, *Nees.;* var. β. *Torr. & Gray, Fl.* 2, *p.* 112. A. Durandi, *Nutt. in herb.* California; *Rev. Mr. Fitch.*

ERIGERON (CŒNOTUS) CANADENSE, *Linn.* On the Gila; *Thurber;* and doubtless almost everywhere.

ERIGERON (CŒNOTUS) ERIOPHYLLUM, *Gray, Pl. Wright,* 2, *p.* 77. On the Sonoita, Sonora; *Wright.*

ERIGERON MACRANTHUM, *Nutt.; Gray, Pl. Fendl. p.* 67, *etc.* Cobre, New Mexico; *Wright, Bigelow.*

ERIGERON DIVERGENS, *Torr. & Gray, Fl.* 2, *p.* 175; *Gray, Pl. Wright,* 2, *p.* 77; var. CINEREUM. W. Texas to the Gila (*Thurber*) and Tucson, Sonora; *Schott.*

ERIGERON BELLIDIASTRUM, *Nutt.; Gray, l. c.* New Mexico; *Wright.*

ERIGERON (CŒNOTUS) SUBDECURRENS? Conyza subdecurrens, *Gray, Pl. Fendl. p.* 78, *& Pl. Wrigh,* 1, *p.* 172. W. Texas (on the Pecos) to the Gila and Sonora; *Thurber.* San Luis Rey, California; *Parry.* It is very doubtful if this be De Candolle's plant, of which I found no specimens in the *reliquiæ* of Berlandier's collection.

ERIGERON GLAUCUM, *Ker.; Torr. & Gray, Fl. l. c.* Monterey, California; *Parry, etc.*

ERIGERON DOUGLASII, *Torr. & Gray, l. c.;* var. foliis angustissimis fere filiformibus. Mountains near San Diego, California; *Parry, Thurber, Schott.*

ERIGERON (POLYACTIDIUM) DELPHINIFOLIUM, *Willd.; Gray, Pl. Wright, l. c.* Cobre, New Mexico, &c.; *Wright, Bigelow, Thurber,* (a canescently hirsute variety.)

ERIGERON MODESTUM, *Gray, l. c.* Live Oak creek, Texas; *Wright.*

ERIGERON BIGELOVII (sp. nov.): cinero-hispidum; caulibus (6–8-pollicaribus) e basi lignescente ramosis adscendentibus, ramulis monocephalis; foliis linearibus spathulato-lanceolatis acutatis, inferioribus spathulatis integerrimis in petiolum attenuatis; involucro subtriseriali, squamis lineari-lanceolatis acuminatis margine scariosis dorso subglandulosis parcissime hispidis, exterioribus brevioribus; ligulis 40–50 uniserialibus purpureis; acheniis hispidis; pappo e setis hispidulis 15–16 corollam disci subæquantibus et totidem squamellato-setaceis subtriplo brevioribus. Near Fronteras, New Mexico, March, April; *Bigelow.* Also collected by Mr. Wright, but in too few specimens for distribution. The species should rank next to E. modestum; but its heads are nearly twice as large; the rays (3 lines long) purple, more imbricated; the involucre scarcely hispid, and the pappus less fragile; the exterior series longer. It is one of the species intermediate between Erigeron (Pseuderigeron) and Diplopappus.

DIPLOPAPPUS ERICOIDES, *Torr. & Gray, Fl.* 2, *p.* 182; var. HIRTELLA, *Gray, Pl. Fendl. p.* 69. Rocky places throughout New Mexico and adjacent districts.

DISTASIS MODESTA, *DC. Prodr.* 5, *p.* 279. High plateaus on the Rio Grande, Pecos, etc. On Mt. Carmel Dr. *Parry* gathered a glabrate autumnal form, with longer and rigid branches, which is somewhat peculiar.

TOWNSENDIA STRIGOSA, *Nutt.; Torr. & Gray, Fl. l. c.* El Paso, and adjacent parts of Chihuahua.

TOWNSENDIA (MEGALASTRUM) WRIGHTII: suffrutescens, viscoso-puberula; ramis adscendentibus (subpedalibus) apice nudis; foliis spathulatis integerrimis setigero-apiculatis inferne in petiolum marginatum attenuatis; involucri biserialis squamis ovato-lanceolatis longe caudato-acuminatis submarginatis extus glanduloso-puberulis; ligulis magnis; pappo in radio et disco conformi multisetoso.—Aster? (Megalastrum) Wrightii, *Gray, Pl. Wright,* 2, *p.* 75. Stony hills on the Rio Grande, 60 or 70 miles below El Paso; *Wright.* Mouth of the great cañon of the Rio Grande; *Bigelow.* This striking plant is clearly only an extreme form of Townsendia, with the pappus more copious and finer than usual.

EREMIASTRUM BELLIOIDES, *Torr. & Gray, Pl. Thurber, p.* 320; *& in Pacif. R. Road Expl.* 6, *p.* 361, *t.* 6. On the desert of the Colorado of the West; *Thurber.* Fort Yuma, etc.; *Schott.* The specimens all too young.

KEERLIA BELLIDIFOLIA, *Gray & Engelm. Pl. Lindh.* 2, *p.* 220. On the Nueces and Blanco; *Wright, Parry.*

APHANOSTEPHUS RAMOSISSIMUS, *DC.*; *Gray, Pl. Wright, l. c.* On the Nueces, Rio Grande, etc.

This varies greatly in foliage, etc. The following are some of the numbers under which it is distributed in Berlandier's collection: 2061, 1787, 1074, 2504, 3168, 1888, 1077, 2507.

BELLIS INTEGRIFOLIA, *Michx.* Low places on the Pecos, Limpio, etc.; *Bigelow, Wright.* The minute hairs on the achenium are glochidiate.

GYMNOSPERMA CORYMBOSUM, *DC. Prodr.* 5, *p.* 312. Along the Rio Grande. All three of De Candolle's Mexican species must be reduced to one.

GUTIERREZIA WRIGHTII, *Gray, Pl. Wright,* 2, *p.* 78. Between Babocomori and Santa Cruz, Sonora; *Wright.* Cobre; New Mexico, *Bigelow.*

GUTIERREZIA GYMNOSPERMOIDES, *Gray, l. c.* Low banks of the San Pedro, Sonora; *Wright.* Santa Maria, Chihuahua, *Thurber.*—Lower leaves often pinnatifid.

GUTIERREZIA SPHÆROCEPHALA, *Gray, Pl. Fendl. p.* 73, *& Pl. Wright, l. c.* From Indianola, Texas, to Cobre, New Mexico, and Chihuahua.

GUTIERREZIA ERIOCARPA, *Gray, Pl. Wright,* 1, *p.* 94. Along the Rio Grande. Often confounded with G. sphærocephala, and probably not really different.

GUTIERREZIA MICROCEPHALA, *Gray, l. c.* Common on the frontiers, and in Texas near the coast.

GUTIERREZIA EUTHAMIÆ, *Torr. & Gray, Fl.* 2, *p.* 123. Common in New Mexico, on the Rio Grande below El Paso, and in the northern parts of Chihuahua and Sonora. G. divaricata is only a loosely flowered variety of this, to which many of our specimens would be referred.

GUTIERREZIA TEXANA, *Torr. & Gray, l. c.* Common in the middle district of Texas.

SOLIDAGO ANGUSTA, *Torr. & Gray, l. c.* Eastern Texas; *Thurber.*

SOLIDAGO NEMORALIS, *Ait.;* VAR. MOLLIS. S. mollis, *Bartling; Gray, Pl. Wright,* 2, *p.* 79. S. incana, *Torr. & Gray, Fl.* 2, *p.* 221. New Mexico and western Texas, in various places; *Thurber, Bigelow, Wright, Parry.* The plant runs into S. nemoralis, and must be appended to that widely distributed species.

SOLIDAGO RADULA, *Nutt.* Southern Texas; *Parry.* Includes S. rotundifolia, *DC.* and S. scaberrima, *Torr. & Gray.*

SOLIDAGO OCCIDENTALIS, *Nutt. in Torr. & Gray, l. c.* Common on the banks of the Mimbres, New Mexico; *Wright, Bigelow.* San Luis Rey, California; *Parry.*

SOLIDAGO PETIOLARIS, *Ait.; Torr. & Gray, l. c.* Cobre, New Mexico, etc.

SOLIDAGO ELONGATA, *Nutt.; Torr. & Gray, l. c.* California; *Schott.* New Mexico; *Bigelow.*

SOLIDAGO CALIFORNICA, *Nutt.; Torr. & Gray, l. c.* Mountains east of San Diego; *Parry,* etc. Mr. Thurber gathered a Solidago, which may be a variety of this, in Chihuahua.

SOLIDAGO CANADENSIS, *Linn.* var. PROCERA, *Torr. & Gray, Fl.* Cobre, etc., New Mexico; *Bigelow.*

LINOSYRIS ARBORESCENS, (sp. nov.): glabra, viscidula; caule 10-pedali lignosa; ramis apice corymboso-polycephalis; foliis anguste linearibus acutis, ramulorum subulatis; involucro pauciseriali disco breviore 20–25-floro, squamis lanceolatis acutis carinatis margine scarioso-ciliolatis; appendicibus styli lanceolato-subulatis portionem stigmatiferum æquantibus; acheniis brevibus turgidis pubescentibus.—California; *Rev. Mr. Fitch.* The flowering branchlets in Mr. Fitch's collection are stated to belong to "a tree 10 feet high." They are slender and very leafy; the leaves are one or two inches in length, about a line wide, much like those of L. vulgaris, only a little viscid. Corymb crowded. Heads three lines long; the flowers all tubular, but occasionally a marginal one shows a tendency to become irregular, and to have its anthers abortive. Receptacle alveolate and toothed. Achenia all fertile, short-oblong,

turgid, not compressed. This is surely a congener of L. vulgaris, and no less so, perhaps, of Ericameria resinosa, *Nutt.*, the ligules of which are often imperfect. In two directions, species which I cannot separate from Linosyris make too close an approach to Aplopappus.—(*Vide Pl. Wright*, 1, p. 96, & 2, p. 81.)

LINOSYRIS (CHRYSOTHAMNUS) VISCIDIFLORA, *Torr. & Gray;* var. PANICULATA. California; *Schott.* The locality not recorded. This, with a Californian specimen gathered on the Sacramento in Wilkes' Exploring Expedition, perhaps belongs to an undescribed species; but the distinctions between it and L. viscidiflora, (a bad name,) on the one hand, and Ericameria resinosa, *Nutt.*, on the other, are not clear. Better specimens of these plants are needed for illustration.

LINOSYRIS GRAVEOLENS, *Torr. & Gray, l. c.* Cobre, New Mexico; *Bigelow.* Sierra de los Animos; *Wright.*

LINOSYRIS PULCHELLA, *Gray, Pl. Wright*, 1, *p.* 96, & 2, *p.* 80. Sandy banks of the Rio Grande, New Mexico; *Wright, Bigelow.* Sand hills, Chihuahua; October; *Thurber.*

LINOSYRIS WRIGHTII, *Gray, Pl. Wright*, 1, *p.* 95, & 2, *p.* 80. Along the Rio Grande, New Mexico, etc.; *Wright, Bigelow.* As already remarked, some forms appear to connect L. hirtella with this species.

LINOSYRIS CORONOPIFOLIA, *Gray, Pl. Wright*, 1, *p.* 96. Lower Rio Grande to Eagle Pass, Los Moros, etc.; *Schott, Parry, Bigelow.*

LINOSYRIS? CARNOSA, *Gray, Pl. Wright*, 2, *p.* 80. Subsaline soil west of the Chiricahui mountains; *Wright.* Gathered by Mr. Wright; the affinities of the plant still doubtful.

LINOSYRIS (APLODISCUS) DRUMMONDII, *Torr. & Gray, Fl.* 2, *p.* 233. Prairies between Indianola and San Antonio, Texas; *Parry.* On the lower Rio Grande; *Schott.*

LINOSYRIS (APLODISCUS) MEXICANA, *Schlecht. Hort. Hal. p.* 7, *t.* 4. Aplopappus (Aplodiscus) discoideus, *DC.* Lower Rio Grande? *Schott*, who also gathered a var. TOMENTOSA: pube laxa decidua lanata. The particular locality not recorded.

LINOSYRIS (APLODISCUS) MENZIESII, *Gray, Pl. Wright*, 1, *p.* 97. Aplopappus Menziesii, *Torr. & Gray.* San Luis Rey, San Diego, Carisso creek, &c.; *Parry, Schott*, &c. Common in dry places, growing in bunches. Dr. Hulse gathered in the valley of the Sacramento a scabrous variety of this, with the lower leaves large and obovate.

APLOPAPPUS (ERICAMERIA) ERICOIDES, *Hook. & Arn. Bot. Beech, p.* 146. California; *Schott.*

APLOPAPPUS (ERICAMERIA) LARICIFOLIUS, *Gray, Pl. Wright*, 2, *p.* 80. Guadalupe Pass, New Mexico; *Wright.* Organ mountains; *Bigelow.*

APLOPAPPUS PHYLLOCEPHALUS, *DC. Prodr.* 5, *p.* 347. A. rubiginosus, *Torr. & Gray, l. c.* Lower Rio Grande; *Schott.* The species was founded on Berlandier's No. 2278, which is a state of the species named A. rubiginosus in the Flora of North America, but just beginning to blossom, and with nearly sessile heads.

APLOPAPPUS SPINULOSUS, *DC. l. c.* Everywhere common along streams, from Texas to Sonora.

APLOPAPPUS GRACILIS, *Gray, Pl. Fendl. p.* 76. Common through New Mexico and Sonora in sandy places.

APLOPAPPUS (PRIONOPSIS) CILIATUS, *DC. Prodr.* 5, *p.* 346. Plains and alluvial banks of rivers, western and southern Texas; *Bigelow, Schott.*

XANTHISMA TEXANUM, *DC. Prodr.* 5, *p.* 94; var. BERLANDIERI, *Gray, Pl. Wright*, 1, *p.* 98. On the lower Rio Grande; *Schott.* This is the form, with very obtuse involucral scales, on which the genus was founded, viz: Berlandier's No. 2039, misprinted 2639, gathered near

Medina. Some of the specimens afterwards collected by Berlandier (distributed as Nos. 2562 and 2573) connect this with the variety Drummondii, (Centauridium Drummondii, *Torr. & Gray*,) which has acute or cuspidate involucral scales.

GRINDELIA SQUARROSA, *Dunal.*; var. GRANDIFLORA, *Gray, Pl. Wright*, 1, *p.* 98, etc. On the Manzanal, Texas, etc. It is No. 1921 of Berlandier's collection.

GRINDELIA LANCEOLATA, *Nutt.; Torr. & Gray, l. c.* Cobre, New Mexico; *Thurber, Bigelow.* Probably a mere variety of G. squarrosa.

GRINDELIA ARGUTA, *Schrader, in DC. l. c.* Cobre cañon; *Wright, Thurber.* Probably this is likewise G. squarrosa.

GRINDELIA INULOIDES, *Willd.*; var. MICROCEPHALA. G. microcephala, *DC. Prodr.* Southern and western Texas; *Schott, Parry.* This is the same as Berlandier's plant, (No. 2057,) on which De Candolle founded his G. microcephala. The achenia are of the same shape as in G. inuloides; but their thick walls are generally smooth and even, yet some of them show traces of the corky-rugose character of those of genuine G. inuloides.

PENTACHAETA AUREA, *Nutt. in Trans. Amer. Phil. Soc.* 7, *p.* 336; *Torr. & Gray, Fl.* 2, *p.* 249. Var. *β.* capitulis majoribus multiradiatis.—San Luis Rey; February. Var. *γ.* capitulis multo minoribus; involucri squamis plerumque obtusis; ligulis 7–10.—Cordilleras, near San Felipe, California, on the eastern slope; June. The first variety is a strong vernal form, with larger heads than in my specimens from Nuttall, yet agreeing very well with his description. The second is a later, much branched state, I believe, of the same species, although the heads are only one-third as large, the rays and the involucral scales proportionally fewer, and the latter either obtuse or retuse, or merely mucronate. The pappus of this occasionally consists of 6 or 8 bristles. The comparison of both forms with Nuttall's original specimens shows that they all belong to one species.

BRADBURIA HIRTELLA, *Torr. & Gray, Fl.* 2, *p.* 250. Eagle Pass, etc., on the Rio Grande, Texas; *Schott.*

HETEROTHECA SCABRA, *DC.; Torr. & Gray, l. c.* San Antonio to Presidio del Norte, etc.; *Bigelow, Schott, Parry.* Very tall specimens were gathered at Presidio by Dr. Bigelow, growing four feet high.

HETEROTHECA FLORIBUNDA, *Benth. Bot. Voy. Sulph. p.* 24. San Luis Rey, California; October; *Parry.* This is certainly Bentham's H. floribunda, and is the same as No. 275 of Coulter's California collection, although the heads are somewhat larger. I fear it passes into H. grandiflora, *Nutt.*

CHRYSOPSIS CANESCENS, *Torr. & Gray, Fl.* 2, *p.* 256. On the Cibolo, Salado, and Limpio, Texas; *Bigelow, Schott.*

CHRYSOPSIS VILLOSA, *Nutt.* San Estaban, New Mexico; *Bigelow.*

CHRYSOPSIS FOLIOSA, *Nutt.* New Mexico, northern Sonora, etc. This and C. hispida vary greatly in appearance, and are probably to be reduced to C. villosa.

CHRYSOPSIS HISPIDA, *Hook.* Clefts of rocks between the San Pedro and Pecos; *Bigelow.*

CHRYSOPSIS PILOSA, *Nutt.* On the Rio Grande near Coleto creek; *Schott.*

LAPHAMIA HALIMIFOLIA, *Gray, Pl. Wright*, 1, *p.* 100, *t.* 9. Hills of the San Pedro; *Wright, Bigelow.*

LAPHAMIA ANGUSTIFOLIA, *Gray, l. c.* High rocky hills of the Pecos, in crevices of the limestone, and mountains near Live Oak creek; *Bigelow, Wright.* Also between San Pedro and the Puercos; *Schott.*

LAPHAMIA ANGUSTIFOLIA? var. LACINIATA: caulibus elongatis diffusis; foliis oblongis subcuneatis laciniato-lobatis.—Crevices of rocks along the Rio Grande, Texas; October; *Bigelow, Schott.* This is doubtless an autumnal state either of L. angustifolia or of L. halimifolia, with weak stems prolonged to the length of a foot. From the foliage it might as well be judged to be a state of the latter, but the rayless heads and flowers are those of the former. It seems to indicate that the two species may not really be distinct.

LAPHAMIA BISETOSA, *Torr. in Pl. Wright*, 2, *p.* 106. Limestone rocks below Mount Carmel, on the Rio Grande; October; *Parry.* Heads as large as in L. rupestris.

LAPHAMIA DISSECTA, *Torr. in Pl. Wright*, 2, *p.* 81. Crevices of limestone, cañon of San Carlos, and near Presidio del Norte, on the Rio Grande; *Parry, Bigelow.*

LAPHAMIA (PAPPOTHRIX) RUPESTRIS, *Gray, Pl. Wright*, 1, *p.* 99, *t.* 9. Crevices in basaltic rocks on the Limpio; also San Estaban, Florence mountains, Escondido creek, etc.; *Wright, Bigelow, Parry.*

LAPHAMIA (PAPPOTHRIX) CINEREA (sp. nov.): nana, lanoso-tomentulosa; caulibus subdiffusis usque ad apicem foliosis; foliis oppositis rotundis subintegerrimis parvis, adultis subglabratis; pedunculis folia paullo superantibus; acheniis sæpius 3–4-nervatis; pappo rigidio tubo corollæ vix longiore.—On rocks near Escondido creek; September; *Bigelow.* This differs from the last, possibly not specifically, in its somewhat floccose woolly pubescence, which renders all the young parts canescent, its entire or very obscurely toothed leaves, its rather longer peduncles, the longer proper tube to the corolla, its proportionally shorter pappus of stouter and more rigid bristles; and some of the achenia have four salient and unequally disposed ribs or nerves, but the greater number three, of which two are usually approximate at one margin. The leaves are from three to six lines in diameter, orbicular or broadly ovate, sometimes obscurely cordate, entire, or obsoletely repand-toothed.

PERITYLE CORONOPIFOLIA, *Gray, Pl. Wright*, 2, *p.* 82. Cobre, New Mexico; *Bigelow, Wright.* Arroyo de los Nogales, Sonora; *Schott.*

PERITYLE PARRYI, *Gray, Pl. Wright*, 2, *p.* 106. In a cañon of the Rio Grande below Mount Carmel; *Parry.*

PERITYLE AGLOSSA, *Gray, l. c.* With the preceding; *Parry.* This is an annual, not suffrutescent at the base, as stated in the published description; and the larger leaves are often two inches wide.

PERITYLE NUDA, *Torr. Mss.; Gray in Torr. Bot. Whippl. Rep. p.* 100. On the Gila, near the Pimo village; *Parry.* The rays are plainly yellow.

PERITYLE EMORYI, (*Torr. in Emory, Rep. N. Mex.* 1848, *p.* 142): ligulis ovalibus; pappo uniaristato, arista setiformi corolla breviore inferne nuda vel scabra, versus apicem parce retrorsum vel patentissime barbellata-hispida.—On the desert of the Colorado of the West; *Emory, Schott,* etc. Fort Yuma; *Major Thomas.* This plant so closely resembles P. nuda in foliage, (although the leaves are not always so much cut,) pubescence, in the size of the heads and broad scales of the involucre, in every respect, indeed, except in the awn to the pappus, (the squamellae of which are, perhaps, less united,) that it is far most probable the two are forms of one species. In this case the name of P. Emoryi, which was indicated and published in 1848, would, on all accounts, take precedence, and P. nuda be held as a variety of it. P. plumigera is distinguished by the smaller heads, narrower involucral scales, and longer upwardly barbellate awn of the pappus.

PERICOME CAUDATA, *Gray, Pl. Wright*, 2, *p.* 81. Cobre, New Mexico; *Wright, Bigelow.* Hot Springs, east of the Mimbres; *Bigelow.*

BACCHARIS CŒRULESCENS, *DC. Prodr.* 5, *p.* 402. From the lower Rio Grande to the Mimbres, and the Colorado of the West.

BACCHARIS CŒRULESCENS, *DC. Prodr.* 5, *p.* 402. var. foliis angustioribus. B. Pingræa, *Nutt. in Trans. Amer. Phil. Soc.* 7, *p.* 337, non *DC.* San Luis Rey, California; *Parry.* The specimen accords with No. 305 of Wright's N. Mexican collection, and is, I doubt not, merely a narrow form of B. cœrulescens, *DC.* But it is Nuttall's B. Pingræa, which is wrongly adduced as a synonym of B. Douglasii in *Torr & Gray, Fl. N. Am.* 2, *p.* 259, the real B. Douglasii (= No. 1776 Pl. Hartw.) not being then known to the authors.

BACCHARIS CONSANGUINEA, *DC. Prodr.* 5, *p.* 408. San Diego? California; *Schott.*

BACCHARIS PILULARIS, *DC. l. c.* San Luis Rey, California; *Parry.*

BACCHARIS SALICINA, *Torr. & Gray, Fl.* On the Rio Grande and Mimbres; *Wright, Bigelow*, etc.

BACCHARIS ANGUSTIFOLIA, *Michx?; Gray, Pl. Lindh.* 2, *p.* 224. Fort Inge, Texas, to the San Pedro valley, Sonora, etc.; *Schott, Bigelow.*

BACCHARIS EMORYI (sp. nov.): suffruticosa, glabra, paniculato-ramosissima; ramulis angulato-striatis; foliis subspathulato-linearibus obtusis uninerviis integerrimis (subpollicaribus) deciduis vel raris, ramulinis minimis; capitulis solitaris geminisve in ramulos breves vel pedunculos paniculatos; involucro fœmineo obovato majusculo multiseriali pappo dimidio breviore; squamis glabris appressis coriaceis obtusis, exterioribus ovatis, intimis linearibus; acheniis glaberrimis.—Very common on the Gila; *Emory*, coll. in 1846, etc. Fort Yuma, E. California; *Major Thomas.* Sterile plant not seen. Involucre of fertile flowers 3 or 4 lines long; the thick scales closely appressed, and all the outer ones very obtuse, their very slight scarious margin not ciliate. Pappus half an inch long, whitish.

BACCHARIS SERGILOIDES (sp. nov.): suffruticosa, glabra, confertim ramosissima; ramis ramulisque angulatis rigidis articulatis sæpissime aphyllis; foliis dum adsunt raris parvis spathulatis uninerviis, ramulorum ad bracteas minimas reductis; capitulis parvis in ramulos confertis subsessilibus, masculis magis glomeratis; involucro obovato, squamis multiseriatis appressis glabris oblongis, vel interioribus lanceolatis; fœm. acutis; masc. omnino obtusis; receptaculo conico subpaleaceo; acheniis glabris; pappo brevi.—Along the Gila or Colorado; *Emory*, 1846. Dry arroyos, 50 miles west of the Colorado; *Bigelow.* Southern part of California; *Dr. J. Le Conte.* Apparently two or three feet high, and very bushy and broomlike; the numerous heads only two, or, at most, three lines in diameter.

BACCHARIS BRACHYPHYLLA, *Gray, Pl. Wright*, 2, *p.* 83. Southern borders of New Mexico; *Wright.*

BACCHARIS WRIGHTII, *Gray, Pl. Wright*, 1, *p.* 101. Western Texas to Chihuahua; common.

BACCHARIS PTARMICÆFOLIA, *DC. Prodr.* 5, *p.* 419; *Schultz, in Bot. Herald, p.* 303. Hill sides between Babocomori and Santa Cruz, Sonora; *Wright* (1201). This is the same as Seemann's plant from the Sierra Madre, and, except in the smaller leaves and heads, accords very well with a specimen from the valley of Mexico, collected by Schaffner, and named B. ptarmicæfolia by Dr. Schultz. It accords still better, perhaps, with the character of B. thesioides, to which De Candolle's species and all these specimens are probably to be referred.

BACCHARIS BIGELOVII (sp. nov.): herbacea, glabra; ramulis striato-angulatis; foliis subviscosis oblongis lanceolatisve basi in petiolum angustatis grosse argute serratis, majoribus subincisis vel duplicato-serratis uninerviis obsolete venosis; capitulis masculis et fœmineis laxe paniculato-corymbosis parvis (lineas 2 longis) breviter pedicellatis 15–18-floris; involucri squamis 3–4-seriatis oblongo-lanceolatis sub-acutis margine scarioso eroso superne ciliatis; pappi setis fl. masc. subclavellatis.—B. ptarmicæfolia? *Gray, Pl. Wright*, 2, *p.* 83. Mountain ravine, Santa Cruz, Sonora; *Wright* (1200, male). Puerto de Paysano; *Bigelow* (both sexes). Oak woods between Babocomori and Santa Cruz; *Thurber*. The additional specimens, of both sexes, show this to be clearly different from the preceding, and probably an unpublished species. The leaves in Dr. Bigelow's specimens, from which the character is principally taken, are much broader than in Wright's or Thurber's, more irregularly toothed or incised, and all obtuse, while those of Wright's are lanceolate or linear-lanceolate, and often acute.

BACCHARIS RAMULOSA, *Gray, Pl. Thurb. p.* 301. Aplopappus (Aplodiscus) ramulosa, *DC. Prodr.* 5, *p.* 350. Linosyris (Aplodiscus) ramulosa, *Gray, Pl. Wright*, 1, *p.* 97, *&* 2, *p.* 80. Organ mountains, Cobre, etc., New Mexico; *Wright, Bigelow*. Guadalupe cañon; *Parry*. Mr. Wright and Dr. Gregg collected only the male plant, apparently the same with that published by De Candolle from Keerl's Mexican collection. The fertile plant now being known, the plant is found to be a genuine Baccharis. Berlandier likewise collected specimens in the mountains of San Luis Potosi (No. 1352.)

TESSARIA (PHALACROCLINE) BOREALIS, *Gray, Pl. Fendl. p.* 75, *& Pl. Wright, l. c.* River bottoms from the Rio Grande, New Mexico, to the Colorado of the West; gathered by all the collectors. Shrubby, 4–8 feet high, called *Arrow-wood;* forming dense thickets.

PLUCHEA CAMPHORATA, *DC.; Torr. & Gray, Fl.* 2, *p.* 261. San Luis Rey, California; *Parry*. Heads rather larger and the pedicels more downy; otherwise just as in the eastern plant.

PLUCHEA FŒTIDA, *DC.; Torr. & Gray, l. c.* Low places on the San Pedro, Texas; *Bigelow*.

FILAGINOPSIS MULTICAULIS, *Torr. & Gray, Fl.* 2, *p.* 263, *& in Pope R. R. Survey, t.* 3. Eastern Texas to El Paso and Chihuahua. Evidently F. Drummondii, *Torr. & Gray*, is not a distinct species. It is distributed among Berlandier's *reliquiæ*, under the Nos. 568, 1011, 1067, 1958, 2109, 2241, 2497.

DIAPERIA PROLIFERA, *Nutt.; Torr. & Gray, l. c.* Stony hills of the Pecos and Blanco; Texas; *Wright*.

EVAX (HESPEREVAX) CAULESCENS, *Gray, in Bot. Whipp. Rep. p.* 101, *t.* 11. Psilocarphus caulescens, *Benth. Pl. Hartw. p.* 319. Sacramento valley, California; *Mr. Fitch*.

PSILOCARPHUS TENELLUS, *Nutt.; Torr. & Gray, l. c., & in Whipp. Rep. l. c.* With the last; *Mr. Fitch*.

STYLOCLINE MICROPOIDES, *Gray, Pl. Wright*, 2, *p.* 84. Fronteras, New Mexico; *Wright, Parry*.

ECLIPTA ERECTA, *Linn.*; VAR. BRACHYPODA, *Torr. & Gray*. San Antonio, San Pedro, and the lower Rio Grande, Texas; *Schott*, etc.

BORRICHIA FRUTESCENS, *DC.* Texas, on the Pecos; *Wright*. Galveston and the lower Rio Grande; *Schott*.

SILPHIUM SCABERRIMUM, *Ell.; Torr. & Gray, Fl.* 2, *p.* 279. On the Sabinal, Texas; *Wright*.

BERLANDIERA TEXANA, *DC. Prodr.* 5, *p.* 516; *Deless. Ic. Sel.* 4, *t.* 26. Coleto creek and the Rio Grande, Texas; *Schott.*

BERLANDIERA LYRATA, *Benth. Pl. Hartw. p.* 17. Cobre, Mimbres, Mule creek, etc, New Mexico; *Bigelow, Wright.* On the Rio Grande and in the Sierra Madre, Sonora; *Schott*, etc.

ENGELMANNIA PINNATIFIDA, *Torr. & Gray. l. c.* Rock creek, Texas; *Bigelow.* On the Rio Grande, at Cleto creek; *Schott.* A marked variety of this, with single and larger heads, smaller pappus, and less lobed leaves, was gathered by Thurber at Ojo Caliente, Chihuahua.

MELAMPODIUM CINEREUM, *DC.; Gray, Pl. Wright*, 1, *p.* 103, & 2, *p.* 85, & var. RAMOSISSIMUM (M. ramosissimum, *DC.*) Common in Texas and New Mexico. Very various forms occur in Berlandier's collection, under Nos. 833, 2242, from San Fernando, Coahuila; 1492, 1881, from Bexar; and 607, 2017, from Laredo and the Nueces.

MELAMPODIUM HISPIDUM, *H. B. K.; Gray, Pl. Wright*, 2, *p.* 85. Between the San Pedro and Santa Cruz, Sonora; *Wright.* Accords well with Mexican specimens collected by Schaffner.

MELAMPODIUM LONGICORNU, (*Gray, Pl. Thurber, p.* 321): annuum, hispidulum, diffuse ramosum; foliis lanceolatis subintegerrimis; pedunculis alaribus filiformibus (¾–2 unc. longis) monocephalis; involucri squamis internis fructiferis 7–10 nervoso-striatis dorso vix muricatis apice in cornu longissimum extus sericeo-puberulum circinnatum productis; ligulis aureis oblongis.—Near Santa Cruz, Sonora; *Thurber.* Santa Magdalena, Sonora; *Schott.* The published character of this curious species is here somewhat amended, since Mr. Schott's specimens (which are in good flower, while those of Mr. Thurber were in fruit) show conspicuous rays much longer than the disk; but they have the same long and silky horns. The leaves are not always perfectly entire, nor all obtuse.

DICRANOCARPUS, *Nov. Gen.*

Capitulum pauciflorum; floribus exterioribus 3–4 fœmineis subradiatis, ligula minima 2–3-loba, stylo breviore; disci totidem sterilibus, tubo corollæ cylindrico, limbo cyathiformi 5-fido. Involucrum 1–2-bracteolatum (bracteolis linearibus parvis), 3–4-phyllum: squamæ oblongæ, obtusæ, membranaceæ, erectæ, subplanæ, demum deciduæ. Receptaculum planum: paleæ lineares parvæ inter flores. Antheræ oblongæ, ecaudatæ. Stylus fl. masc. inclusus, indivisus, apice clavato-pubescens; fl. fœm. bifidus, ramis inappendiculatis. Ovaria disci inania, epapposa. Achenia (radii) difformis, nempe 1–2 linearia vel subulata, subteretia, lævia, persistentia, aristis 2 validis lævissimis divergentibus seu recurvis persistentibus cornuta; cætera breviora et crassiora, intus sæpe tuberculato-rugosa, aristis brevioribus vel obsoletis.—Herba annua, gracilis, fere glabra, *Heterospermi* facie, microcephala; foliis oppositis 3–5-sectis, summisve integris, filiformibus; capitulis solitariis pedunculatis; floribus flavis.

DICRANOCARPUS PARVIFLORUS, *Gray, Pl. Thurber, p.* 322, *adn.* Heterospermum dicranocarpum, *Gray, Pl. Wright*, 1, *p.* 109. Plains below San Carlos, Tamaulipas; *Parry.* Only mature achenia of this plant were known, from Wright's first collection, persisting on the receptacle from which everything else had fallen. The flowers, etc., furnished by Dr. Parry, enable us to complete the characters; these show that the plant is by no means a Heterospermum, (although allied to that genus,) but a new generic type which, according to the classification adopted, must be referred to the rather incongruous subtribe Melampodineæ. The flowering heads are only a line and a half in length, and the scarcely explanate ray-corollas are

smaller than those of the disk. The fertile ovaries, at least the one or two which make the longer and subulate achenia, begin to elongate soon after anthesis, and to project to twice or thrice the length of the involucre. The scales of the latter subtend the fertile flowers, but do not inclose or embrace them. Paleæ of the receptacle much smaller than the involucral scales, linear, plane, forming a circle between the ray and the disk, one subtending each sterile flower. Sterile style barely bidentate at the apiculate tip. The longer achenia, which usually persist after the fall of the involucre, etc., are from 3 to 4½ lines long, (excluding the awns,) barely half a line in thickness, slightly obcompressed, even, not at all margined, tipped with two stout, diverging or sometimes recurved-spreading, smooth, rigid, inarticulated and persistent, subulate awns, of 1½ to 3 lines in length. There is usually only one such achenium to each capitulum. The others are shorter and thicker, and tuberculate-rugose inside, but otherwise similar, or one of them barely 2 lines long, oblong, truncate at both ends, the apex bearing two very short and divaricate or almost obsolete awns or horns.

PARTHENIUM INCANUM, *H. B. K.; Gray, Pl. Wright*, 1, *p.* 103, & 2, *p.* 85. P. ramosissimum, *DC. Prodr.* 5, *p.* 532. From the Pecos to Cobre, etc.; *Bigelow, Wright, Schott.* On the Rio Grande, below Mount Carmel; *Parry.*

PARTHENIUM ARGENTATUM (sp. nov.): fruticosum, pube brevi appressima sericeo-incanum; foliis spathulato-lanceolatis oblongisve in petiolum longe attenuatis parce dentatis seu laciniatis sub-triplinerviis; ramulis floridis elongatis nudis oligocephalis; involucri squamis obtusissimis; acheniis sericeis; pappo e paleis 2 membranaceis lanceolatis.—Near Escondido Creek, Texas, in rocky places, Sept. 1852; *Dr. Bigelow.*—A well marked species, connecting the sections Argyrochæta and Parthenichæta; the leaves and branches whitened with a very fine and close silky-silvery pubescence, which appears to be wholly or nearly persistent. Leaves one to two inches long, including the tapering base and petiole, 2 to 5 lines wide, mostly acute, scarcely veined, beset on each margin with from one to three salient teeth, or sharp lobes. Flowering branchlets slender, 4 to 8 inches long, nearly leafless and peduncle-like, bearing 3 to 7 sub-sessile heads (as large as those of P. incanum) in a cluster. Exterior scales of the involucre short, orbicular-ovate; the inner orbicular, scarious-membranaceous. Paleæ of the pappus lanceolate or oblong-lanceolate, rather narrower and less obtuse than in P. Hysterophorus, puberulent, the inner edge more or less adnate to the base of the broadly obovate and cucullate emarginate ligule.

PARTHENIUM HYSTEROPHORUS, *Linn.* Texas, etc.; common in low places.

PARTHENICE MOLLIS, *Gray, Pl. Wright*, 2, *p.* 85. Near Santa Cruz, Sonora; *Wright, Thurber.*

EUPHROSYNE AMBROSIÆFOLIA, *Gray, Pl. Wright*, 1, *p.* 102, & 2, *p.* 85. Near Conde's Camp, New Mexico; *Wright.* Cook's Springs; *Bigelow.*

IVA DEALBATA, *Gray, Pl. Wright*, 1, *p.* 104. Leon Springs; *Bigelow.* Lagunas de Patos, Chihuahua; *Thurber.*

DICORIA, *Torr. & Gray, in Emory, Rep.*, 1848, *p.* 143.

Capitulum monoicum; floribus fœmineis 2 in ambitu, masculis 8-12 in disco. Involucrum patulum, duplex, exterius e phyllis 5 ovalibus herbaceis uniseriatis, interius e squamis 2 orbiculatis tenuiter scariosis planis mox accrescentibus, utraque florem fœmineum fulcrante. Receptaculum parvum, planum, paleis angustis lineari-spathulatis inter flores. *Fl. Foem.* Corolla nulla; stylus alte bifidus, ramis linearibus glabris. *Fl. masc.* Corolla obconica, 5-dentata. Antheræ vix coalitæ, sed filamentis monadelphis. Stylus abortivus in synemate apice 5-dentato

inclusus, simplicissimus. Ovarium nullum. Achenia obcompresso-plana, ala laciniata circumdata, cum squamis fructiferis petaloideo-scariosis iis majoribus involucrum externum multotics superantia. Pappus brevis, plurisetulosus, deciduus vel evanescens.—Herba humilis, ramosa, hispidulo-canescens, alternifolia; capitulis racemoso-paniculatis, fructiferis cernuis.

D. CANESCENS. In the sandy desert of the Gila and of the Colorado; *Emory*. A small specimen of this curious plant was brought home by Col. Emory from his reconnaissance of the Gila, etc., in 1846; but it has not again been met with. The base of the plant is unknown. Leaves, at least the upper ones, alternate, oval, obtusely dentate, on slender petioles, scabrous or hispid, and when young canescently villous on both sides; those of the flowering branches gradually reduced to small and spatulate bracts. Heads short-pedicelled, arranged in loose and nearly leafless spikes or racemes, which are panicled at the summit of the stem in anthesis, only one and a half lines long; but in fruit the whitish and somewhat glandular and erose pair of inner involucral scales become three or four lines long and almost as broad; they are loosely appressed to the achenia which they subtend, and appear to be deciduous with them at maturity. The mature achenia are about 3 lines long, and 2 lines wide, including the strong laciniate-toothed and incised wing, both faces slightly hispid, and carinately one-nerved in the middle; near the summit of the nerve of the inner, and sometimes of the outer face also, a small crest often appears like the rudiments of an anterior and posterior wing. Although the full-grown achenia commonly appear destitute of a pappus, yet in the flowering state there is always a rather conspicuous ring of short bristles surrounding the base of the naked style, and traces of it are generally discernible at maturity. The bristles are united at the base into a ring, and appear to form a true pappus. They consist, however, of single rows of cells, exactly like the short and fine bristly hairs which fringe the margin of the inner involucral scales. It will be seen that the genus belongs to the division Iveæ of De Candolle. The name (from δις, two, and κορις, a bug,) alludes to the two achenia appearing like bugs, or like the achenia of some species of Coreopsis.

AMBROISA PSILOSTACHYA, *DC. Prodr.* 5, *p.* 526; *Gray, Pl. Wright, l. c.* A. coronopifolia, *Torr. & Gray*. Common, from Texas to Sonora. It occurs both with unarmed and tuberculate fruit.*

FRANSERIA TENUIFOLIA, var. TRIPINNATIFIDA, *Gray, l. c.* Common from Texas to Sonora. This is both Ambrosia fruticosa (excl. var. β) and A. confertiflora of De Candolle; but none of the forms in Berlandier's collection are at all shrubby.

FRANSERIA HOOKERIANA, *Nutt.* El Paso to Sonora, etc.; common.

FRANSERIA DUMOSA, *Gray, in Frémont, 2d Exped. p.* 316; var. ALBICAULIS .*F.* albicaulis, *Torr. Pl. Frém. p.* 16. Desert of the Colorado of the West; common; *Thurber, Bigelow, Schott.*

FRANSERIA DELTOIDEA, *Torr. Pl. Frémont, p.* 15. Valley of the Gila; *Parry*. A well-marked species; but it should be compared with F. chenopodifolia, *Benth. Bot. Voy. Sulph.*, from lower California.

* The following is an undescribed species, occurring in Berlandier's *reliquiæ*:

AMBROSIA CHEIRANTHIFOLIA, (sp. nov.): humilis, pube minuta canescens; ramis foliosis; foliis oblongo-lanceolatis seu oblongo-spathulatis integerrimis sessilibus, superioribus flores fœmineos fulcrantibus; capitulis masculis elongato-racemosis ebracteatis; fructibus 4–5-spinosis, spinis crassis.—San Fernando, Cohahuila, 1513, 3013.—A perennial herb, apparently not over a foot in height, considerably branched. Leaves an inch or rather more in length, 3 to 6 lines wide, all undivided and entire, whitened both sides with a fine and short appressed pubescence. Sterile heads 2½ lines long, nearly glabrous, armed with four or five short and stout spines, which are about the length of the similar beak.

HYMENOCLEA MONOGYRA, *Torr. & Gray, Pl. Fendl. p.* 79, *& Pl. Wright, l. c.* Common on the frontier, from Eagle Pass, Texas, to Sonora.

ZINNIA TENUIFLORA, *Jacq. Ic. Rar.* 3, *t.* 590; *Gray, Pl. Wright,* 2, *p.* 86. Sonora and Chihuahua; *Thurber, Schott,* etc.

ZINNIA (DIPLOTHRIX) ACEROSA, *Gray, Pl. Wright,* 1, *p.* 106. Dry hills, from Eagle Springs, etc, to El Paso; *Bigelow,* etc.

ZINNIA (DIPLOTHRIX) GRANDIFLORA, *Nutt.; Gray, Pl. Wright,* 1, *p.* 105. Sonora, Chihuahua, New Mexico, and W. Texas; gathered by all the collectors.

ZINNIA (DIPLOTHRIX) PUMILA, *Gray, Pl. Fendl. p.* 81, *& Pl. Wright, l. c.* Sonora, lower Rio Grande, etc. Intermediate forms appear to connect this with the last.

ZINNIA (HETEROGYNE) ANOMALA, *Gray, l. c. t.* 10, *f.* 2. Eagle Pass on the Rio Grande (*Bigelow*) to the San Pedro, Pecos, etc.

HELIOPSIS PARVIFOLIA, *Gray, Pl. Wright,* 2, *p.* 86. Between Babocomori and Santa Cruz, Sonora; *Wright, Thurber.* Some of Mr. Thurber's specimens have larger leaves than those of Wright.

HELIOPSIS BUPHTHALMOIDES, *Dunal,* which is also H. canescens, *H. B. K.* Between San Bernardino and Janos, Chihuahua; *Thurber.*

HALEA TEXANA, *Gray, Pl. Fendl. p.* 83, *& Pl. Wright, l. c.* Gravelly plains, western and southern Texas.

LEPACHYS COLUMNARIS, *Torr. & Gray, Fl.* 2, *p.* 215; & var. PULCHERRIMA. Western Texas to New Mexico.

LEPACHYS TAGETES, *Gray, in Bot. Whippl. Rep. p.* 103. L. columnaris, var.? Tagetes, *Gray, Pl. Wright, l. c.* Western Texas to El Paso, etc.

RUDBECKIA FULGIDA, *Ait.* Western Texas; *Bigelow.*

ALDAMA UNISERIALIS, *Gray, Pl. Lindh.* 2, *p.* 228. Southern Texas; *Schott,* etc.

HELIOMERIS MULTIFLORA, *Nutt.; Gray, Pl. Fendl. p.* 87; and var. HISPIDA, *Gray, Pl. Wright,* 2, *p.* 87. New Mexico, Sonora.

HELIOMERIS TENUIFOLIA, *Gray, l. c.* From the San Pedro, Western Texas to Sonora, Chihuahua, etc.

FLOURENSIA CERNUA, *DC. Prodr.* 5, *p.* 593. From the Pecos and Eagle Pass, on the Rio Grande, to the Mimbres, etc., "sometimes covering large tracts of ground in villages and Mesquite bottoms;" *Schott.*

ENCELIA CALIFORNICA, *Nutt. in Trans. Amer. Phil. Soc.* 7, *p.* 357. San Diego, California; *Schott.*

ENCELIA CONSPERSA, *Benth. Bot. Voy. Sulph. p.* 26. Diluvial banks of the Colorado; February; *Schott.* This must be Bentham's E. conspersa; but the involucre is more pubescent than he describes, the rays glabrous, and the foliage retains much of the close cinereous pubescence. The heads, also, are quite small. It is probably the same as No. 308, of Coulter's Californian collection.

ENCELIA NIVEA, *Benth. l. c.* E. farinosa, *Gray, in Emory Rep. p.* 143. On the Gila; *Emory, Parry,* etc., and the Colorado of the West; *Bigelow.* This is the same as Coulter's No. 327, and must be Bentham's E. nivea, from Lower California, although the characters do not wholly accord.

SIMSIA (GERSEA) CANESCENS, *Gray, Pl. Fendl. p.* 85. Sand hills near Fort Yuma, California, January; *Schott.* A striking species, with a remarkably white-woolly involucre and large showy rays. A less hairy form with laciniate leaves was gathered on the Gila by *Dr. Parry.*

SIMSIA (GERSEA, sed eradiata) PAUCIFLORA, (sp. nov.): hispidulo-scaberrima, ramosissima; foliis parvis (½–¾-pollicaribus) oblongis seu ellipticis utrinque obtusis integerrimis, petiolo nudo; capitulis longiuscule pedunculatis ramulos terminantibus discoideis; involucri squamis exterioribus lanceolatis ovatisve acuminatis subequarreosis albo-hirtis, interioribus obovatis obtusis; achaniis margine cum aristis brevibus (interdum fere obsoletis) longissime villosissimis. Agua Caliente, on the Gila; *Colonel Emory*, November 28, 1846. Sierra Prieta, near Fort Yuma, E. California, December, 1854; *Schott.* Also gathered (with rather large heads) by *Colonel Frémont*, in 1849, somewhere in the interior country of California. Fragments of this plant, too poor to characterize, have been known for some years in a small collection made by Colonel Emory in his earliest exploration of the Gila country. There are now good materials at hand. It appears that the plant must be associated with another from the same region, upon which I formerly proposed to found a genus under the name of *Gersea*, but afterwards (*Pl. Fendl. l. c.*) concluded to append to Simsia. The present species is remarkably distinguished, however, by its woody or suffruticose, slender stems, (apparently belonging to a low and much branched bushy plant,) and by the total absence of the rays, which are remarkably large in its congener. Very likely the genus Gersea (placed between Simsia and Encelia) should be re-established for these two species; but for the present they may be appended to Simsia, although new discoveries may more probably approximate them to Encelia. The heads vary from a quarter to half an inch in diameter. The awns of the pappus are often as long as the much elongated and dense fringe of soft white hairs which surround the otherwise glabrous achenium, but always covered with similar long hairs. Sometimes they are almost obsolete, or reduced to a slender base for the insertion of the tuft of hairs.

SIMSIA (GERSEA) SCAPOSA, *Gray, Pl. Wright. l. c.* Stony hills between the Mimbres and the Rio Grande, New Mexico; *Wright.*

SIMSIA EXARISTATA, *Gray, Pl. Wright.* 2, *p.* 87. On the San Pedro, &c., Sonora; gathered by all the collectors.

SIMSIA (BARKATHIA) CALVA, *Gray, Pl. Lindh.* 2, *p.* 228. Throughout southern and western Texas; "common on dry and stony hill-sides of the chalk and oolite;" *Schott.*

VIGUIERA CORDIFOLIA, *Gray, Pl. Wright.* 1, *p.* 107, & 2, *p.* 89. Common in New Mexico and northern Sonora and Chihuahua; gathered by all the collectors.

VIGUIERA LAXA, *DC.; Gray, l. c.* Cobre, &c., New Mexico; *Wright.*

VIGUIERA LACINIATA, (sp. nov.): frutescens, hispidulo-scabra; foliis plerisque alternis subconfertis petiolatis hastato-lanceolatis incisis seu laciniato-pinnatifidis subtus grosse reticulatis rigidis, summis parvis bracteiformibus; capitulis geminis ternisve breviter pedunculatis; involucri 2–3-serialis squamis ovato-oblongis vix appendiculatis; receptaculo planiusculo; ligulis integerrimis; acheniis subciliatis aristis paleæformibus 2 et squamellis latis apice eroso-dentatis 6—8 coronatis.—Rancho Gamacha, east of San Diego, California, September, 1855; *Schott.* A remarkable species, apparently a low and more or less shrubby plant, with slender branches. Leaves about 1½ inch long, including the petiole, thin but rigid, very scabrous, the coarse teeth, or lobes, ovate or triangular, blunt. Heads nearly half an inch long; rays nearly of the same length. Squamellæ of the pappus thick. Palese of the receptacle acutish.

ACTINOMERIS WRIGHTII, *Gray, Pl. Fendl. p.* 85, *& Pl. Wright. l. c.* Between Cobre and Conde's Camp, New Mexico, etc.; *Wright, Thurber.*

ACTINOMERIS LONGIFOLIA, *Gray, Pl. Wright.* 2, *p.* 89. Mountains east of Santa Cruz, Sonora; *Wright.*

TITHONIA TUBÆFORMIS, *Cass.* Magdalena, Sonora; *Thurber.* "Flowers orange-yellow."

HELIANTHUS CILIARIS, *DC. Prodr.* 5, *p.* 587. From the lower Rio Grande to the Gobre, etc.; New Mexico; also in Sonora, where Mr. Thurber gathered a form with remarkably broad leaves.

HELIANTHUS GROSSE-SERRATUS, *Martens;* var., *Gray, Pl. Wright.* 2, *p.* 89. Valley of the Mimbres, New Mexico; *Wright.* Between the Rio Salado and Victoria, Texas; *Schott.*

HELIANTHUS MAXIMILIANI, *Schrad.; DC. l. c.* Leon Springs, and on the Limpia; *Bigelow.* Rio Seco, Texas; *Schott.*

HELIANTHUS ANGUSTIFOLIUS, *Linn.* Between Indianola and Victoria, Texas; *Schott.*

HELIANTHUS LENTICULARIS, *Dougl. in Bot. Reg. t.* 1265. Valley of the Gila; *Schott.* Common in Texas and New Mexico.

HELIANTHUS PETIOLARIS, var. CANESCENS, *Gray, Pl. Wright.* 1, *p.* 108, *&* 2, *p.* 89. The remarkably silvery-canescent form. On the Rio Grande, below El Paso; *Wright, Bigelow,* etc.

HELIANTHUS, in *Pl. Wright. l. c.*, referred to H. petiolaris. Cobre, *Wright,* (1231,) Escondido creek; *Bigelow.* A singular and still doubtful plant.

HELIANTHUS CUCUMERIFOLIUS, *Torr. & Gray, Fl.* 2, *p.* 319. On the lower Rio Grande; *Schott.*

HELIANTHUS CUCUMERIFOLIUS, var. PRÆCOX. H. praecox, *Englm. & Gray, Pl. Lindh.* H. debilis, var. *Torr. & Gray, Fl. l. c.* Cleto creek, Texas; *Schott.*

HELIANTHUS ARGOPHYLLUS, *Torr. & Gray, l. c.* Cletô creek, between Victoria and San Antonio, Texas; *Schott.* A striking species, recently introduced into the gardens.

HELIANTHUS (HARPALIUM) TEPHRODES, (sp. nov.): humilis, pube appressissima canescens; foliis plerumque alternis ovatis petiolatis subserratis basi trinerviis, junioribus cano-argenteis; pedunculo gracili monocephalo; involucri squamis ovato-lanceolatis mucronato-acutatis; pappo e squamellis paleisve plurimis, majoribus 1—2 sæpius aristiformibus deciduis.—Mirasol del Monte, in the Californian desert of the Colorado, in sandy places by the road-side, October, 1855; *Schott.* The specimen is incomplete, and hardly sufficient for proper determination; the base of the stem and the root unknown. The stems or branches collected are scarcely a foot long, and slender. Leaves about an inch long. Scales of the involucre merely biserial. Rays about 12, yellow; disk-corollas tipped with purple. The chaffy awns of the pappus are sometimes elongated, but often one or both of them reduced to strong squamellæ, like the rest.

COREOPSIS (AGARISTA) CALLIOPSIDEA. Agarista calliopsidea, *DC. Prodr.* 5, *p.* 569. Moist and grassy plains between Monterey and Santa Barbara, California. An unpublished Peruvian species connects Agarista with Coreopsis, of which it can form only a section.

COREOPSIS CARDAMINEFOLIA, *Torr. & Gray, Fl.* 2, *p.* 346. Low places on the Limpia, Rio Grande, etc.

COREOPSIS DRUMMONDII, *Torr. & Gray,* var. Western Texas; *Wright.*

THELESPERMA FILIFOLIUM, *Gray, in Kew Jour. Bot.* 1, *p.* 252, *& Pl. Wright. l. c.* Common in Southern and Western Texas.

THELESPERMA GRACILE, *Gray, l. c.* From the Limpia to Cobre, New Mexico, and Santa Cruz, Sonora, (*Schott.*)

THELESPERMA SUBSIMPLICIFOLIUM, *Gray in Hook. Kew Jour. Bot.* 1, *p.* 252 (nom. paullo mutatum): foliis rigidis anguste lineari-filiformibus, caulinis simplicibus trisectisve, inferiori-

bus et radicalibus interdum 5-sectis vel biternatisectis; capitulis radiatis; acheniis fusiformibus (extimis tantum tuberculato-rugosis) pappo bicorni brevissimo erecto nunc fere obsoleto coronatis. Cosmidium simplicifolium, *Gray, Pl. Fendl. p.* 86. Gravelly hills, near Sacati; *Bigelow.* San Pedro River, Sonora; *Schott.* This has been confused both with T. graciles and T. filifolium, and specimens in Wright's collection have perhaps been distributed as a form of the latter. Its rigid stems and foliage accord with the former, though the leaves are commonly less divided; but the rays distinguish it from that species, while the pappus (reduced to two exceedingly short or obsolete teeth, which are strictly erect, and slightly hairy, but not barbed) distinguishes it from both species. A nearly or quite simple leaved state of this species is my Cosmidium simplicifolium, which name, a little altered to bring it nearer the fact, it is proposed to retain.

Cosmos bipinnatus, var. parviflorus, *Gray, Pl. Wright.* 2, *p.* 90. From the Cobre, New Mexico, to Santa Cruz, Sonora; *Bigelow, Wright, Thurber.*

Bidens bipinnata, L. Chihuahua and Sonora; *Thurber.* Mountains near San Esteban, *Bigelow.* Cobre creek, *Wright.* The awns are only two, but in all other respects the same as B. bipinnata. Wright's No. 345 has the achenia mostly two-awned.

Bidens Bigelovii (sp. nov.): annua, fere glabra; caule ramoso gracile suberecto; foliis trisectis, segmentis 3–5-partitis, lobis oblongis cuneatisve paucius pinnatifido-incisis; capitulis subsolitariis longe pedunculatis; involucro glabriusculo; ligulis albidis? discum haud superantibus sæpiusve nullis; acheniis heteromorphis, exterioribus brevibus lineari-cuneatis truncatis papilloso-hispidulis scaberrimis, pappo nunc breviter 2–3-aristatis nunc brevissime bicorni vel obsoleto, cæteris angustissime linearibus lævibus (semipollicaribus) breviter 2-(raoro 3)-aristatis. Banks of the Rio Limpia; *Bigelow.* Cibolo valley, Texas, *Parry*, etc. Mountain arroyo, Rock creek and Puerto de Paysanos; *Bigelow*, (var. with the awns mostly 3 and longer.) In foliage and aspect this plant is somewhat intermediate between B. bipinnata and B. tenuisecta; in fructification it is much more like B. heterosperma, *Pl. Wright*, but the heads are twice or thrice the size. The outer achenia are truncate and rough in all the specimens. Awns of the disk-achenia 1 to 1½ line long. To this belongs No. 346 of Wright's first collection referred to, B. tenuisecta in *Pl. Wright.* 1, *p.* 109.

Bidens heterosperma, *Gray, Pl. Wright.* 2, *p.* 90. New Mexico; known only from plants raised from seeds gathered by *Wright.*

Bidens fœniculifolia, *DC.*, var. *Gray, Pl. Wright. l. c.* Northern Sonora; *Wright, Thurber.*

Bidens heterophylla, *Ort.?; Gray, Pl. Wright. l. c.* Between the San Pedro and Santa Cruz, Sonora; *Wright.*

Bidens chrysanthemoides, *Michx.* Ojo Caliente, Chihuahua; *Thurber.* San Felipe; *Schott, Bigelow.* B. helianthoides, *H. B. K.*, is probably the same species.

Heterospermum tagetinum, *Gray, Pl. Fendl. & Pl. Wright. l. c.* Mountains of the Limpia and Cobre, New Mexico, *Wright, Bigelow.* Too near H. pinnatum.

Guardiola platyphylla, *Gray, Pl. Wright.* 2, *p.* 91. Sonora, between Babocomori and Santa Cruz; *Thurber, Wright.* Sierra de Pajarito; *Schott.*

Leptosyne Douglasii, *DC. Prodr.* 5, *p.* 531; *Torr. & Gray, Fl.* 2, *p.* 355. Moist and

grassy plains between Monterey and Santa Barbara, California; *Parry*. Dr. Stillman has detected a second species of this genus.*

TUCKERMANIA MARITIMA, *Nutt. in Trans. Amer. Phil. Soc.* 7, *p* 363; *Torr. & Gray, l. c.* San Diego, California; common near the beach all around the bay, March; *Parry*. It has been introduced into the gardens from seeds gathered by Dr. *Parry*, and is a very showy plant.

SANVITALIA ABERTI, *Gray, Pl. Fendl. p.* 87. Stony hills, Cobre, New Mexico; *Bigelow, Wright, Thurber*.

SANVITALIA TRAGIÆFOLIA, *DC. Prodr.* 5, *p.* 628. On the Rio Grande above Presidio; *Schott*.

OLIGOGYNE TAMPICANA, *DC. Prodr.* 5, *p.* 529. Eagle Pass, Santa Rosa, etc., on the Rio Grande; *Bigelow, Schott*.

XIMENESIA ENCELIOIDES, *Cav.* In various forms, especially var. CANA. From the lower Rio Grande to Cobre and the Gila.

VERBESINA PODOCEPHALA, *Gray, Pl. Wright.* 2, *p.* 92. Sonora, near Santa Cruz, *Wright*. Sierra west of Santa Cruz and Tucson; *Schott*. This is nearly related to V. pedunculosa, *Schultz, Bip.* (Actinomeris pedunculosa, *DC.*, Verbesina capitaneja, Nees); but that has the leaves decurrent on the stem.

VERBESINA VIRGINICA, *Linn.* var. (V. microptera & V. polycephala, *DC.*) Lower Rio Grande, etc.; *Schott*.

ZEXMENIA TEXANA, *Gray, Pl. Wright.* 1, *p.* 112. Wirtgenia Texana, *Schultz, Bip. in Seem. Bot. Herald, p.* 304. On the San Antonio, Pecos, San Pedro, and the Rio Grande; *Bigelow, Parry*, etc. Dr. Schultz, apparently with reason, has separated this from Zexmenia, and has referred it to his African genus Wirtgenia, on account of a semilunar or roundish squamula appressed to the base of the achenium on each side, and indeed adherent to it. Here it is of soft fleshy texture when in good condition, but it dries up at length, leaving only a vestige. Dr. Schultz has overlooked the fact that the plant (varying greatly as to the wings of the achenium and the awns of the pappus) is pretty clearly Wedelia hispida, *H. B. K.*, which specific name may claim to be restored. A specimen from Schultz, gathered by Schaffner, in Mexico, near Tacubaya, is the same as a plant cultivated in the *Jardin des Plantes* in the year 1815.

ZEXMENIA BREVIFOLIA, *Gray, Pl. Wright.* 1, *p.* 112. Mountains, etc., on the Rio Grande at the great cañon, Eagle Pass, Rio Concho; *Bigelow, Parry, Schott*.

SPILANTHES NUTTALLII, *Torr. & Gray, Fl.* 2, *p.* 356, var. Western Texas, San Felipe, Piedras Pintas, Zocate creek, Los Moros, etc.; *Bigelow, Schott*.

FLAVERIA CHLORÆFOLIA, *Gray, Pl. Fendl. p.* 88. Comanche and Leon Springs, southern Texas; *Parry, Bigelow*.

FLAVERIA CONTRAYERBA, *Linn.* Along the lower Rio Grande; *Bigelow, Parry*.

SARTWELLIA FLAVERIÆ, *Gray, Pl. Wright.* 1, *p.* 122. Rio Cabeza, Texas; *Thurber*. Plain below San Carlos, Cohahuila; *Schott*.

* LEPTOSYNE STILLMANII (sp. nov.): foliis inferioribus oppositis, omnibus trifidis seu pinnato-5-partitis, segmentis rhachi que planis anguste linearibus; squamis involucri externi oblongis; corollis haud annulato-barbatis; appendicibus styli fl. disci haud apiculatis; achenii glaberrimis, radii apiculatis margine fungoso subrugoso cinctis. In the valley of the Upper Sacramento, *Dr Stillman*.

The single specimen collected is a span high, with shorter and coarser leaves than L. Douglasii, and smaller heads. The scales of the exterior involucre are broader and shorter, rather fewer, and externally sparingly bearded at their base. There is only a faint indication of the bearded ring, so manifest on the tube of the disk-corollas of L. Douglasii; nor do the achenia show a trace of the capitate hairs of that species. The appendages of the style, moreover, are very obtuse, and destitute of the abrupt and sharp tip. Still it is an undoubted congener of L. Douglasii.

ADENOPHYLLUM WRIGHTII, *Gray, Pl. Wright.* 2, *p.* 92. Hill sides at the Cobre, New Mexico; *Wright, Bigelow.*

LEBETINA CANCELLATA, *Cass.; DC. Prodr.* 5, *p.* 639. Prairies near Chihuahua; *Thurber.* Sonora, east of the Sierra Madre; *Schott.* The genus is probably to be reduced to Adenophyllum, as I have elsewhere suggested.

DYSODIA CHRYSANTHEMOIDES, *Lay.* San Estaban and Rock creek; *Bigelow.* Chihuahua; *Thurber.*

DYSODIA POROPHYLLOIDES, *Gray, Pl. Thurber, p.* 322. San Felipe, interior of California; *Thurber.*

HYMENATHERUM (ACIPHYLLÆA) ACEROSUM, *Gray, Pl. Wright.* 1, *p.* 115. Hills, etc., from San Felipe, Texas, to New Mexico and Sonora.

HYMENATHERUM WRIGHTII, *Gray, Pl. Fendl. & Pl. Wright. l. c.* Common in western Texas.

HYMENATHERUM POLYCHÆTUM, *Gray, l. c.* Prairies, from Presidio del Norte to Cobre, New Mexico.

HYMENATHERUM PENTACHÆTUM, *DC.; Gray, l. c.* Rocky or gravelly hills, from lower Texas to Sonora.

HYMENATHERUM TENUIFOLIUM, *Cass.; Gray, l. c.* Gravelly plains, lower Texas to Chihuahua and Sonora.

HYMENATHERUM GNAPHALIOPSIS, *Gray, l. c.* Plains, from the lower Rio Grande to New Leon. In the distribution of Berlandier's collection this occurs under the Nos. 962, 1404, 1407, 1861, 2392. (No. 14076 in *DC. Prodr.* is a typographical error for 1407.) "Called *Lepiana* by the Mexicans, and used by them and the Indians as a remedy for catarrh." *Schott.*

LOWELLIA AUREA, *Gray, Pl. Fendl. l. c.* On the Limpia; *Wright, Bigelow, &c.*

CHRYSACTINIA MEXICANA, *Gray, l. c.* Hills of the San Pedro, Limpio, etc., Texas and New Mexico.

NICOLLETIA EDWARDSII, *Gray, Pl. Wright.* 1, *p.* 119, *t.* 8. Gravelly plains, Presidio del Norte, Arroyo San Juan, etc.; *Bigelow, Parry.* Called "Yerba Venado" by the Mexicans.

TAGETES MICRANTHA, *Cav.; Gray, l. c.*, 2, *p.* 93 Cobre, New Mexico; *Wright, Bigelow.**

CLAPPIA, Nov. Gen.

* At Laredo, on the Lower Rio Grande, in August, 1829, Berlandier (as appears from the remains of his collections bough from his widow) gathered a few specimens of a Composita of doubtful affinity. The specimens were not numbered, and doubtless have not been distributed by him. It is to be sought on the lower part of the Rio Grande. The plant appears to be the type of a new genus, which I dedicate to Dr. A. Clapp, of New Albany, Indiana, one of the most zealous botanists of our Western States, and the author of an important work, entitled "A Synopsis or Systematic Catalogue of the Medicinal Plants of the United States, 1852."

Capitulum multiflorum, heterogamum; ligulis fœmineis; fl. disci hermaphroditis, corollis tubulosis, limbo 5-fido. Involucrum imbricatum, pauciseriale; squamis laxis ovalibus obtusissimis lineatis. Receptaculum convexum, epaleatum, setoso fimbrilliferum. Antheræ ecaudatæ. Styli rami fl. herm. angusti, glabri, cono brevissimo obtuso superati. Achenia subangulata, 10-costata. Pappus simplex, e setis rigidis seu paleis angustissimis 20–25 hispido-serrulatis, disci corollam subæquans. Herba ramosa, glabra, foliis carnosis alternis confertis filiformibus obsolete parceque glanduloso-punctatis, ramis floridis apice nudis monocephalis; floribus ut videtur flavis.

CLAPPIA SUÆDÆFOLIA.—Herb a foot or more in height, probably from a perennial root and fleshy stems, and with fleshy leaves much resembling those of Suæda or Chenopodina maritima. Peduncles 2 or 3 inches long, somewhat thickened above; the head half an inch in diameter. Scales of the involucre consimilar, but the outer successively shorter, distinct, marked with several dark impressed lines apparently of a glandular nature; the margin narrowly scarious. Fimbrillæ of the receptacle as long as the ovaries. Ligules 10 or 12, linear, tridenticulate at the apex. Lobes of the disk-corollas oblong-lanceolate. Achenia a line and a half long, truncate at the broad summit, minutely and sparsely hispid. Pappus ferruginous, rigid, rather

Porophyllum macrocephalum, *DC. Prodr.* 5, *p.* 648. Sonora, on the Sonoita; *Wright.* Near Santa Cruz; *Thurber.*

Porophyllum Greggii, *Gray, Pl. Wright,* 1, *p.* 120. Dry hills, etc., southern part of New Mexico and adjacent districts in Chihuahua; *Wright, Bigelow, Captain Smith.* On the Colorado of the West; *Schott.*

Porophyllum scoparium, *Gray, l. c.* On the San Pedro and Puercos, El Paso, etc.; *Wright, Bigelow, Thurber.*

Agassizia suavis, *Gray & Engelm. Pl. Lindh.* 2, *p.* 229. Gravelly hills, southern and western Texas, on Rock creek, etc.; *Parry, Bigelow.*

Gaillardia pinnatifida, *Torr.* Common from Rock creek, the Pecos, etc., to El Paso, Cobre, etc., New Mexico.

Gaillardia pulchella, *Foug.; Torr. & Gray, l. c.* Common from Texas to Sonora.

Gaillardia lanceolata, *Michx.* Eastern Texas, on the coast; *Schott.*

Palafoxia linearis, *Lag.; DC. Prodr.* 5, *p.* 124. Diluvial banks of the Colorado, Sonora; *Schott.* Fort Yuma, California; *Major Thomas.* Chihuahua, east of Rio Santa Maria; *Schott.*

Palafoxia Hookeriana, *Torr. & Gray, Fl.* 2, *p.* 368. Valley of the Rio Grande below San Elizario; *Wright, Bigelow.* Sand hills, Medanos; *Thurber.*

Palafoxia Texana, *DC. Prodr.* 5, *p.* 125. Texas from San Antonio to Eagle Pass. Los Moros, New Mexico; *Bigelow.*

Palafoxia callosa, *Torr. & Gray, l. c.* From the Guadalupe river, Texas, to the Pecos.

Florestina tripteris, *DC. Prodr.* 5, *p.* 655. On the Pecos, Escondido, etc.; *Bigelow, Wright, Parry.*

Chænactis tenuifolia, *Nutt.; Torr. & Gray, Fl.* 2, *p.* 370. San Diego, California; *Thurber,* (a pretty large plant, a foot high,) *Schott,* (a small form, only 3 or 4 inches high.)

Chænactis stevioides, *Hook. & Arn.; Gray, Pl. Wright.* 2, *p.* 94. Hills, near Camp Fillmore, New Mexico; *Bigelow, Wright,* Cooke's spring, New Mexico; *Thurber.*

Chænactis carphoclinia (sp. nov.): annua? lanuloso-pubescens, mox glabrata, subviscosa; caule ramosissimo; foliis 1–2-pinnatipartitis, segmentis parvis linearibus (1–3 lin. longis); capitulis subcorymbosis; involucro viscoso; corollis albidis? radii limbo ampliato sed regulari discum haud superantibus, pappi paleis 4 ovato-lanceolatis acuminatis; receptaculo paleis nonnullis setaceis involucrum aequantibus inter flores onusto.—Gila and Colorado desert; *Schott.* Fort Yuma, E. California; *Major Thomas.* Plant 4 to 9 inches high, resembling slender forms of C. stevioides. Heads corymbose-panicled, half an inch long, on short and slender peduncles, 12—25-flowered. Involucre either glandular-viscid or hirsute with viscid hairs. The remarkable peculiarity of the species consists in a set of filiform or setaceous persistent paleæ on the receptacle, 5 to 10 in number, subtending as many disk-flowers; but in every other respect the plant is a true Chænactis.

Hymenopappus luteus, *Nutt.; Gray, Pl. Fendl. p.* 97. Stony hills, Cobre, New Mexico; *Bigelow, Wright;* and Mimbres; *Thurber.* Guadalupe cañon; *Captain Smith.* Cordilleras

longer than the achenium; the bristles, or rather aristiform paleæ, consimilar, except that a few are smaller, tapering upwards, simple, but all more or less coherent at the very base, so that they fall off in a ring. There are faint indications of some dark glands on the foliage, which, if confirmed in better specimens, may justify a reference of the genus to the Tagetineæ, in which case it would make as perfect a transition between that subtribe and the Heleniem as another genus of the same region (Sartwellia) does between the latter and the Flaverieæ.

behind San Diego; *Parry;* (a somewhat glabrate form.) Nuttall's original specimens are depauperate and not fully developed; they gave rise to the unfortunate phrase "heads small," in the Flora of North America. But, in fact, they are perhaps the largest of the genus. The conspicuous pappus at length projects beyond the villosity of the achenium.

HYMENOPAPPUS FLAVESCENS, *Gray, Pl. Fendl. l. c.* Common from the Pecos to El Paso, etc.

HYMENOPAPPUS CORYMBOSUS, *Nutt.; Torr. & Gray, Fl.* 2, *p.* 370, and var.? NUTTALLII. On the San Pedro and Rio Grande, etc., Texas; *Bigelow, Schott.*

ACARPHÆA ARTEMISIAEFOLIA, *Harv. & Gray, in Pl. Fendl. p.* 98, *in not.* (TAB. XXXII.) Cordilleras east of San Diego, California, June; *Parry.* This rare plant was known only from a specimen in Coulter's Californian collection, No. 313, which presented no mature fruit. Dr. Parry's specimen is also a single one, (*more suo,*) but with well-formed fruit. The only points to be added to the original account of the plant are that the viscid-glandular leaves are scarcely, if at all, hoary; the corollas appear as if they were flesh-color rather than pale yellow, and the marginal ones are hardly ampliate; the mature achenia, all fertile and similar, are slightly incurved, compressed, and not manifestly striate. The compression of the achenia tends to confirm the genus as distinct from Chænactis, although the numerous analogous cases in this subtribe warn us to beware of genera resting solely on the absence of pappus. Vide, *Plantæ Wrightianæ,* 1, *p.* 123.

BAHIA (ERIOPHYLLUM) ARTEMISIÆFOLIA, *Less.; DC. Prodr.* 5, *p.* 567. Monterey, etc., California; *Parry.* A shrubby plant, 2 or 3 feet high.

BAHIA (ERIOPHYLLUM) TRIFIDA, *Nutt. in Trans. Amer. Phil. Soc.* 7, *p.* 374; *Torr. & Gray, l. c.* Dry sandy hills, San Diego, California; *Parry.*

BAHIA (ERIOPHYLLUM) CONFERTIFLORA, *DC. l. c.; Torr. & Gray, l. c.* Dry places near Santa Barbara, California; *Parry,* etc. From San Diego to the Colorado; *Schott.*

BAHIA RUBELLA (sp. nov.): annua, pumila, floccoso-lanuginosa, ramosa; pedunculis subcorymbosis monocephalis; foliis alternis spathulatis apice sæpius tridentatis; involucro campanulato 8-phyllo lanuginoso, squamis erectis discum adæquantibus; ligulis 8 roseis ovalibus 3–4-dentatis; appendicibus styli fl. disci cono acutissimo superatis; receptaculo conico; acheniis hirsutulis; pappi paleis 8 enerviis obtusissimis.—Interior of California, in a dry valley, near San Felipe, (between San Diego and the Rio Colorado;) June; *Parry.* Plant 4 inches high; the leaves half on inch long. Peduncles from half an inch to an inch in length. Involucre 3 lines long. Disk-flowers 14–20, yellow. Ligules oval, deeply notched or 3–4-toothed at the apex. Pappus about one-quarter the length of the prismatic achenium; the paleæ of equal length, four of them obovate-oblong, the alternate ones narrower and more spatulate, entire. With the style of true Bahia, but the appendages tipped with a longer and sharper cone, this little plant has the involucre of the section Eriophyllum, and a still more elevated (even conical) receptacle; and so tends to combine the two. In the rays, which are said to be pale purple and white, it accords with the obscure B. trolliifolia, of which it is probably a true congener.

BAHIA ABSINTHIFOLIA *Benth.*, var. DEALBATA, *Gray, Pl. Wright.* 1, *p.* 121. Sandy or gravelly soil, from the San Felipe to the Mimbres, and south to Chihuahua, etc.

BAHIA BITERNATA, *Gray, Pl. Wright.* 2, *p.* 95. Ojo de Gavilan, etc., New Mexico; *Wright, Thurber, Bigelow.* Llanos del Babuquibari, Sonora; *Schott.*

Bahia pedata, *Gray, Pl. Wright*, 1, *p.* 123. On the Pecos, Limpia, etc.; *Thurber, Wright.*

Bahia (Achyropappus) Bigelovii (sp. nov.): annua, striguloso-puberula; caulibus gracilibus diffuse ramosis; foliis oppositis tripartitis, segmentis integerrimis vel inferiorum 2–3-fidis lineari-filiformibus; pedunculis filiformibus monocephalis; involucri laxi squamis 8–9 oblongo-ovatis obtuse acuminatis glanduloso-pubescentibus; ligulis totidem oblongis; acheniis basi hirsutulis; pappi paleis 8 obovatis obtusissimis enerviis tubo corollæ disci viscoso-hispido fere dimidio brevioribus. Valley of the Limpio, W. Texas, July, 1852; *Bigelow.* Stems branched from the base a foot or more in height. Leaves short-petioled; their divisions 6 to 12 lines long. Peduncles solitary, 3 or 4 inches long. Involucre scarcely 3 lines in length, a little shorter than the disk. Flowers yellow; those of the disk as many as 30; their corolla a line and a half long; the slender and glandular-hispid tube abruptly dilated into the cyathiform 5-lobed limb. Style as in B. ambrosioides. Achenia linear-clavate, obtusely tetragonal, nearly a line and a half long. This is nearly related to the Schkuhria? Neo-Mexicana, *Gray, Pl. Fendl. p.* 96; which, however, is rayless and has disk-corollas scarcely longer than the pappus. While on the one hand it is plainly a congener of Achyropappus schkuhrioides, *Link & Otto.*, (which in specimens from De Candolle and others, contrary to the generic character, taken from A. anthemoides, has a pappus very much shorter than the corolla,) on the other it is equally inseparable from true Bahia (B. ambrosioides, B. absinthifolia, etc.) I am unable to say exactly how the various species are to be divided between Bahia and Schkuhria; but apparently all the many flowered ones must be excluded from the latter.

Amblyopappus pusillus, *Hook. & Arn. in Hook. Jour. Bot.* 3, *p.* 321, (vide *Gray, Pl. Wright*, 1, *p.* 123, *in adn. & Bot. Whippl. Rep. p.* 106.) Infantea Chilensis, *Remy, in Gay, Fl. Chil.* Aromia tenuifolia, *Nutt. in Trans. Amer. Phil. Soc.* 1, *p.* 395. Monterey, California, near the seaside, forming dense clumps; *Parry.*

Villanova chrysanthemoides, *Gray, Pl. Wright*, 2, *p.* 96. Cobre, New Mexico; *Bigelow, Wright.*

Schkuhria Hopkirkia, *Gray, l. c.* Sonora; *Wright.* Seeds only were collected, from which plants were raised for two seasons.

Schkuhria Wrightii, *Gray, l. c.* Sandy soil, between Babocomori and Santa Cruz, Sonora; *Wright, Thurber.*

Amblyolepis setigera, *DC.*; *Gray, l. c.* Plains of Texas, from the Leona to the Pecos and Eagle Pass; *Bigelow, Wright, Schott.*

Riddellia tagetina, *Nutt; Torr. in Emory, Rep. t.* 5. Texas to Sonora; common on the frontier.

Riddellia arachnoidea, *Gray, Pl. Fendl. p.* 94, *& Pl. Wright*, 1, *p.* 121. Common on the Rio Grande, etc., from the Nueces (where it was also gathered by *Berlandier*, No 1041, 2471) to the Mimbres, etc.

Hymenothrix Wislizeni, *Gray, Pl. Fendl. l. c.* Mule Springs, etc., New Mexico, and Sonora; *Bigelow, Wright.*

Hymenothrix? Wrightii, *Gray, Pl. Wright*, 2, *p.* 97. Sonora; *Wright, Schott, Bigelow, Thurber*, mostly in the mountains. New Mexico, at the Cobre, Organ mountains, etc.; *Bigelow.*

Actinolepis multicaulis, *DC. Prodr.* 5, *p.* 655; *Torr. & Gray, Fl.* 2, *p.* 376. (Tab. XXXIII.) Dana's Ranch, below San Luis Obispo, California; *Parry.*

Burrielia lanosa, *Gray, in Bot. Whipp. Rep. p.* 107. Sonora, between Tucson and the Gila; *Parry.* Pappus of 4 long and 4 short palee in the disk-flowers, but of five each in the ray.

BURRIELIA GRACILIS, *DC. Prodr.* 5, *p.* 664. California, near Monterey, etc.; May; so abundant as to give a yellow appearance to the hills; *Parry*. Mostly rather large forms. In one specimen a slight disposition to have lobes to the leaves appears.

BURRIELIA CHRYSOSTOMA, *Torr. & Gray. Fl.* 2, *p.* 379. Hill sides, common from Monterey to San Diego, California. The specimens occur mixed with the preceding, from the larger forms of which they are externally undistinguishable. Unless the more obtuse receptacle affords a character, it will probably come to be regarded as only an epappose state of B. gracilis.

BURRIELIA PLATYCARPHA (sp. nov.): erecta, spithamæa, subramosa, laxe pubescens; foliis sæpissime trifidis segmentisque filiformi-linearibus; pedunculis sursum incrassatis; involucri multiflori squamis ovatis trinerviis ligulisque oblongo-linearibus sæpius 7; corolla imberbi; pappo conformi e paleis 7–8 oblongo-ovatis aristatis achenio æquilongis; receptaculo acute conico.—Valley of the upper Sacramento; *Dr. Stillman*. This is a genuine Burrielia, having the paleæ of the pappus all alike and awned. The scales of the involucre (fully 4 lines long) and the ligules are considerably larger than those of the largest states of B. gracilis and B. (Bäeria) chrysostoma, although fewer. It is related on the one hand to B. gracilis, from which it is at once distinguished by its lobed leaves, stouter peduncles, more upright habit, fewer rays and involucral scales, the latter much broader as well as larger, 3-nerved and more pointed, and by the equally larger and broader as well as more numerous paleæ of the pappus; on the other to B. (Dichæta) Fremontii, which has much smaller heads, a dimorphous pappus of much smaller paleæ, etc.*

BURRIELIA (PTILOMERIS) ANTHEMOIDES. Ptilomeris anthemoides, *Nutt. in Trans. Amer. Phil. Soc.* 7, *p.* 382. Hymenoxys (Oxypappus) calva, *Torr. & Gray, Fl.* 2, *p.* 381. Grassy places, Monterey, California; *Parry*.

LASTHENIA (HOLOGYMNE) GLABRATA, *Lindl. Bot. Reg. t.* 1780. Monterey, California; *Parry*.

MONOLOPIA MAJOR, *DC. Prodr.* 6, *p.* 74. Argillaceous hills, San Fernando, beyond Los Angelos, California (a glabrate form); *Parry*.

TRICHOPTILIUM, Nov. Gen.

Capitulum homogamum multiflorum; floribus hermaphroditis tubulosis. Involucrum circiter 10-phyllum, biseriale; squamis æqualibus membranaceis, interioribus glandula apiculatis. Receptaculum nudum, scrobiculatum. Corolla cylindrica; tubo proprio brevi angusto, dentibus 5 patentibus ovatis. Antheræ ecaudatæ. Styli rami compressi, glaberrimi, apice tantum capitellato-truncato brevissime hirtelli. Achenia immatura oblonga, basi angustata, hirsutissima. Pappus corolla brevior, e paleis 5 hyalinis enerviis oblongo-lanceolatis in setas plurimas rigidas profunde fissis. Herba nana, hyemo-annua vel biennis, dichotoma, humifusa, floccoso-lanata, subglandulosa; foliis alternis cuneato-oblongis argute inciso-dentatis lobatisve, dentibus cuspidato-acuminatis; pedunculis terminalibus et alaribus filiformibus monocephalis; corollis ochroleucis?

TRICHOPTILIUM INCISUM, *Gray, Mss.; Torr. in Pacif. R. Road Expl.* 6, *p.* 361, *t.* 5. Psathyrotes incisa, *Gray, Pl. Thurber, p.* 322. On the desert of the Colorado, in the southeastern

* It may be remarked that Mr. Bentham refers No. 1791 of Hartweg's Californian collection to Burrielia (Dichæta) Fremontii; but all the specimens in my set are entirely destitute of pappus, which could not have been the case in those which Mr. Bentham examined. Since the two plants apparently agree in all other particulars, it is most likely that my specimens belong to an epappose state of the species; just as all Nuttall's species of Ptilomeris are probably forms of one. At any rate, it is now certain that Ptilomeris and Dichæta, as well as Bäeria, must be reduced to sections of Burrielia.

part of California, near the Colorado; *Thurber*. Near Fort Yuma; *Lieut. Du Barry*. Only a single specimen of this interesting plant (but in a more advanced state than Mr. Thurber's) was gathered by Lieut. Du Barry, and communicated to Dr. Torrey. The latter pointed out the oversight I had committed in respect to the pappus, and which led me wrongly to refer the plant to Psathyrotes, whereas it technically belongs to the Heleniæ, and adds another genus to that subtribe. The five thin paleæ of the pappus are beautifully dissected into stiff capillary bristles, of which the central one is somewhat the longest, and the rest on each side successively shorter. Involucre loosely very woolly externally; the thin and lax scales oblong and oblong-lanceolate, nerveless, and about as long as the disk.

HULSEA, Torr. & Gray, (Nov. Gen.)

Capitulum multiflorum, radiatum; floribus radii ligulatis fœmineis, disci tubulosis. Involucrum hemisphæricum; squamis subtriseriatis membranaceis laxis, extimis paullo brevioribus. Receptaculum planum, epaleaceum, alveolato-dentatum, dentibus brevibus corneis. Ligulæ 20–30, lineares. Corollæ fl. herm. tubo gracili viscoso-glanduloso, fauce cylindraceæ, limbo 5-dentato, dentibus triangulari-ovatis fere glabris. Antheræ ecaudatæ. Styli rami obtusi, longitrorsum puberuli, exappendiculati. Achenia conformia, linearia, subtetragono-compressa, deorsum attenuata, villosa præsertim ad margines. Pappus (villis achenii vix longior) e paleis 4 tenuibus hyalinis enerviis latis obtusissimis erosis vel fimbriatis. Herbæ perennes, viscoso-pubescentes, macrocephalæ, alternifoliæ; caule florifero sub-aphyllo; floribus flavis.

H. Californica (*Torr. & Gray*): elata; caule vel pedunculo 3–7-cephalo; involucri squamis linearibus apice attenuatis; floribus aureis; ligulis sæpe filamentis sterilibus instructis; pappi paleis cuneato-rotundis apice truncato eroso-denticulatis.—Mountains east of San Diego, California, in bushy places, June; *Parry*. A portion of the inflorescence was alone gathered of this interesting plant, apparently a branch of a tall herb, with the alternate leaves reduced to ovate-lanceolate and sessile bracts, of about half an inch in length. The paniculate or subcorymbose heads are about as large as those of Arnica montana. Ligules half an inch long. Disk-flowers perhaps 100. Achenia 3 lines long, blackish, minutely striate on each face, also villous (but much more so on the margins) with long and thick hairs. Pappus of four nearly equal, thin, and hyaline paleæ, of less than a line in length, much shorter than the tube of the corolla. Foliage, etc., unknown. The genus is dedicated to G. W. Hulse, M. D., of Louisiana, late a surgeon of the United States army, and a zealous cultivator of botany, to whom we are indebted for many interesting plants of Florida, California, etc. Since its establishment upon a single and incomplete specimen, a second species has been detected by Dr. Newberry (H. nana, *Gray in Pacific R. R. Report*, 6, *p.* 76, *t.* 13,) confirming the genus. The broad and flat receptacle and the elongated compressed achenia are remarkable in the Heleniæ, subdiv. Eurelenieæ, to which the genus is to be referred.

Helenium autumnale, *Linn.* Texas; west to the San Pedro; *Bigelow*.

Helenium puberulum, *DC. Prodr.* 5, *p.* 667; *Torr. & Gray, Fl.* 2, *p.* 385. California; not uncommon. Rio Fronteras, Sonora; *Thurber*.

Helenium tenuifolium, *Nutt.; Torr. & Gray, l. c.* Sonora; *Capt. Smith*.

Helenium microcephalum, *DC. l. c.* Sandy moist places, Presidio del Norte, Van Horne's

Wells, etc., *Bigelow*. This species includes De Candolle's H. elegans and his H. heterophyllum, at least in part, viz: No. 2113 of Berlandier's collection, which is from Reynosa. De Candolle also cites Berlandier's No. 107 and No. 190, and the habitat Tampico. I have no specimens from that station. From these the character, "pappi paleis breviter aristatis," may have been drawn. But in those from Reynosa the palea are very obtuse and pointless, just as in H. microcephalum.

ACTINELLA RICHARDSONII, *Nutt.; Gray, Pl. Fendl., p.* 101. New Mexico and western Texas, abounding on stony hills.

ACTINELLA ODORATA, *Gray, l. c., & Pl. Wright. l. c.* From the lower Rio Grande to Sonora, the Gila, etc.; *Parry, Bigelow, Schott.* "Limonillo" of the Sonorians.

ACTINELLA CHRYSANTHEMOIDES, *H. B. K.; Gray, Pl. Wright.* 1, *p.* 122, *adn.* Soccoso, Sonora; *Bigelow.*

ACTINELLA SCAPOSA, *Nutt.*; *Gray, l. c., & in Bot. Whippl. Rep. p.* 108. Gravelly or rocky hills, throughout western Texas and New Mexico; in diverse forms.

ACTINELLA ARGENTEA, *Gray, Pl. Fendl. l. c.* On the Mimbres; *Bigelow, Dr. Henry.*

ACTINELLA BIGELOVII, *Gray, Pl. Wright.* 2, *p.* 96, *adn.* New Mexico, on Ben More, and near the Cobre, etc.; *Bigelow.*

ACTINELLA LINEARIFOLIA, *Torr. & Gray, Fl.* 2, *p.* 382. Western Texas to El Paso and Eagle Pass, etc.; in various forms.

TRIDAX BICOLOR, *Gray, Pl. Fendl. p.* 104. Bachimba, Chihuahua; *Thurber.* Plant taller than the specimens of Wislizenus, a foot or two high; the upper leaves alternate and on pretty long petioles; head larger than in *T. procumbens*; rays rose purple; pappus not tinged with purple.

GALINSOGA PARVIFLORA, *Cav.*; var. CARACASANA, and var. SEMICALVA; *Gray, Pl. Wright,* 2, *p.* 98. Cobre, New Mexico; *Wright.*

ACHYRACHÆNA MOLLIS, *Schauer; DC. Prodr.* 7, *p.* 292. Monterey, California; in grassy places; *Parry, etc*

LAYIA (CALLICHROA) PLATYGLOSSA, *Gray, Pl. Fendl., p.* 103. California, San Pasqual; *Thurber.* Monterey, etc.; *Parry.* Colorado desert; *Schott.*

LAYIA (CALLIACHYRIS) FREMONTII, *Gray, Pl. Fendl. l. c.* Upper Sacramento, California; *Dr. Stillman.*

LAYIA (MADAROGLOSSA) HETEROTRICHA, *Hook. & Arn. Bot. Beech.; Gray, l. c.* Dana's Ranch, below San Luis Obispo, California; in dry gravelly soil; *Parry.*

LAYIA (MADAROGLOSSA) HIERACIOIDES, *Hook. & Arn. l. c.* San Juan Battista, near Monterey, California; *Parry.* Remarkable for its very short rays.

LAYIA (MADAROGLOSSA) CARNOSA, *Nutt. in Torr. & Gray, Fl.* 2, *p.* 394. Sea beach, Monterey, California; *Parry.* The very small rays appear to be white.

LAYIA (MADAROGLOSSA) NEO-MEXICANA, *Gray, Pl. Wright.* 2, *p.* 98. New Mexico; *Bigelow.* Tucson, Chihuahua; *Parry.* The pappus is not always present in the ray-flowers.

OXYURA CHRYSANTHEMOIDES, *DC. Prodr.* 5, *p.* 693. Monterey, California; May; on grassy hill sides.

HEMIZONIA FASCICULATA, *Torr. & Gray, Fl.* 2, *p.* 397. Hartmannia fasciculata, *DC. Prodr.* 5, *p.* 693. Dry plains, San Diego, California; *Parry, Schott, Thurber.* Covers large tracts, and exhales a strong balsamic odor.

HEMIZONIA RAMOSISSIMA, *Benth. Bot. Voy. Sulph. p.* 30. Santa Barbara and San Diego, California; *Schott, Fitch.* This appears to be a common Californian plant, of somewhat variable mode of growth. Mr. Fitch's specimen is the same as Frémont's, marked R and S in his coll. of 1846; as No. 361 of Coulter's Californian collection; and as the *H. fasciculata* of Nuttall, in herb. Hook; (of Gambell's collection, a stricter and smoother form); I believe it is also Bentham's H. ramosissima. The sessile or stipitate glands are sometimes abundant, but not rarely wanting or nearly so. I may remark that to H. angustifolia, *DC.*, (which has no pappus at all, at least in Douglas's specimens,) belongs the H. multicaulis, *Hook. & Arn Bot. Beech. Voy. Suppl., p.* 355; the No. 305 of Coulter's Californian collection; H. decumbens, *Nutt. Pl. Gamb. p.* 175; and apparently the same as specimens gathered near Monterey by Mr. Barclay, although their disk-flowers show a minute pappus. But No. 1797 of Hartweg's collection, referred by Mr. Bentham to H. angustifolia, is exactly H. corymbosa (Hartmannia corymbosa, *DC.*) H. macrocephala, *Nutt. Pl. Gamb. l. c.*, appears to be the same species. H. congesta, *DC.*, is to be distinguished from Madaria chiefly by the shape of the fertile achenia; as noted in the Botany of Whipple's Report.*

CALYCADENIA (OSMADENIA) TENELLA, *Torr. & Gray, Fl.* 2, *p.* 402. Osmadenia tenella, *Nutt.* Dry places near San Diego, California; *Parry, etc.*; June. Subjoined are the characters of two new species, from Frémont's Californian collection of 1846.† They belong to Nuttall's Osmadenia, but have the glands of Calycadenia on the floral and young fascicled leaves, and

*Besides H. Fitchii, recently published in Whipple's Report, there is another extremely well marked species of Hemizonia in Colonel Frémont's collection, the characters of which are subjoined:

HEMIZONIA VIRGATA (sp. nov.): subglabra; caulibus e radice annua ramisve simplicibus gracilibus; foliis linearibus, inferioribus inciso-dentatis basi longe attenuatis, superioribus integerrimis, summis minimis apice glanduloso-truncatis; capitulis oblongis in axillis solitariis subsessilibus vel plerumque ramulos breves foliosos desinentibus racemum virgatum efficientibus; involucri squamis circiter 5 ovatis membranaceis cum paleis extimis receptaculi glandulis stipitatis, mollibus dorso muricatis; floribus ut videtur luteis, radii 5 ligula cuneato-rotunda apice trilobo, disci 10 sterilibus, singulis palea oblonga glanduloso-mucronata amplexatis epapposis; acheniis radii fertilibus obovatis lævibus basi substipitatis apice intus breviter rostratis.—California, probably on the Sacramento; *Col. Frémont.*—Stems a foot or more high. Lower cauline leaves two inches long, the upper ones an inch or less in length and barely a line wide; those fascicled in the axils or crowded on the floral branchlets 1–2 lines wide, spreading; their truncate apex glandular. Heads 3 lines long. Scales of the involucre ovate, cymbiform, half inclosing the fertile achenia, glabrous, beset externally with long and soft glandular-tipped but truncate spreading processes. Ligules 2 lines long and the same width, on a glandular tube of a line in length. Disk-flowers slightly glandular, their infertile ovaries glabrous, destitute of pappus. Receptacle chaffy throughout; the paleæ distinct, membranaceous.

†CALYCADENIA FREMONTII (sp. nov.): caule humili superne parce paniculato-ramoso et hirsuto; foliis anguste linearibus scabris basi setoso-hispidis, caulinis eglandulosis, floralibus apice sæpe glandulam claviformem breviter stipitatam gerentibus; capitulis solitariis terminalibus axillaribusque subsessilibus; ligulis 5–7 tripartitis, segmentis tubulo brevissimo glabro 2–3-plo longioribus; disco circiter 20-floro; paleis receptaculi 12 et ultra oblongis obtusis vix glutinosis connatis; lobis corollarum disci ovatis; achenii radii lævibus utrinque obtusis, disci hirsutulis pappo 10-paleaceo (paleis alternis subulato-productis) æquilongis.—California, (the particular station not recorded;) *Col. Frement.* Stems a span high, from an annual root, erect, rather slender; the branches are not glandular nor glutinous. Cauline leaves an inch or more in length, the lower opposite. Heads few, larger, and with many more flowers than in C. tenella; also with much ampler ligules, (though the tubular portion is very much shorter,) their obovate or oblong segments 3 lines long. Nor are the tinged and perfectly smooth and even ray achenia at all apiculate at either end. The pappus of the (apparently fertile) disk-achenia resembles that of C. tenella, its longer and subulate scales being only half the length of the corolla, and not longer than the achenium itself.

CALYCADENIA PAUCIFLORA (sp. nov.): caule paniculato-ramoso glabello; ramis floriferis diffusis filiformibus flexuosis capitula solitaria subsessilia ad nodos singulos gerentibus; foliis anguste linearibus scabris inferne setoso-ciliatis, floralibus cum iis in axillis fasciculatis brevibus glandula claviformi superatis; radio uni-ligulato, lobis ligulæ tripartitæ tubulo duplo longioribus; disco

one of them has short and broad lobes to the corolla of the disk. The glands are manifestly not of generic importance; and as in habit there is no longer a marked distinction, it will be evident, on comparing the characters of C. Fremontii with those of the two new Hemizoniæ above described, that it is becoming increasingly difficult to preserve Calycadenia as a genus.

LAGOPHYLLA DICHOTOMA, *Benth. Pl. Hartw. p.* 317. On the Sacramento, California; *Rev. Mr. Fitch.* Branchlets only; rays evidently yellow. The genus is distinguished from Hemizonia by the obcompressed fertile achenia, completely enclosed by the involucral scales, and by the cuneiform, deeply trifid rays. The habit also is peculiar. Yet, perhaps, it may be found to pass into Hemizonia; though it is more distinct than Calycadenia.

LAGOPHYLLA FILIPES, *Gray in Bot. Whippl. Rep. p.* 109, *adn.* Hemizonia filipes, *Hook. & Arn. Bot. Beech. Voy. Suppl. p.* 356. On the Sacramento, California; *Rev. Mr. Fitch.* The specimens are merely in flower. I suspect that in the achenia, no less than in other characters, as well as in habit, the plant will accord with *Lagophylla*, and thus raise that genus to three known species. The receptacle is not chaffy in the centre. The small rays are three-parted nearly to the base.

MADIA SATIVA, *Molina.* In springy places, California, near Monterey; April.

HARPÆCARPUS EXIGUUS: tenellus, diffusus; pedunculis filiformibus; paleis receptaculi 3 in cupulam florem hermaphroditum includentem coalitis; acheniis haud rostratris.—Sclerocarpus exiguus, *Smith in Rees Cycl.; Hook. & Arn. Bot. Beech, Voy. p.* 355, *adn.* California, (probably Mariposa county,) *Rev. Mr. Fitch.* Plant 2 to 4 inches high, including the fruit-bearing peduncles (which are an inch or more long); the branches diffuse. Root annual. Leaves from a quarter to half an inch long. Heads little over a line long, with 4 to 7 ray-flowers, and a single hermaphrodite one, which is inclosed in a cup formed of only three paleæ. Besides this character, and the diminutive size and diffuse habit of this plant, it differs from H. madarioides, *Nutt.*, of Oregon, in the less falcate ray-achenia, of barely a line in length (only half the size of those of the other species), the apex of which is obtusely apiculate, but not at all rostrate. H. madarioides has, when young, a simple and strict stem, leaves of one or two inches in length, and, according to Nuttall, sometimes attains the height of 2 feet.

COINOGYNE CARNOSA, *Less.; DC. Prodr.* 6, *p.* 42. Salt places and seashore near San Diego California; *Parry.* The genus should stand next to Jaumea, in the Heleniæ, from which it differs principally in the want of the pappus.

BAILEYA PAUCIRADIATA, *Harv. & Gray, in Pl. Fendl. p.* 105. Diluvial banks of the Colorado, Sonora; February, 1855; *Schott.* These are the only specimens of this plant I have seen, excepting the original ones in Coulter's collection. They possess the lower cauline and radical leaves, which are pinnatifid, with few and unequal linear lobes, some of them 1–2-toothed or lobed. The root is that of a biennial or winter annual.

BAILEYA PLENIRADIATA, *Harv. & Gray, l. c., & Pl. Wright. l. c.* Very common from the Rio Grande to the Colorado, Sonora, etc.

tripaleate trifloro, corollæ lobis oblongis; achenio radio lævi obtusô, iis disci hirsutulis pappo 10-paleaceo (paleis alternis subulato-productis) longioribus.—California; *Col. Frémont.* This species presents nearly the habit of C. tenella, except that the prolonged branches are simple or sparingly forked, and bear lateral nearly sessile heads; and they are scarcely, if at all, glandular or viscid. The heads are still smaller, or at least narrower, and, as far as examined, have uniformly only one ray and three disk flowers; the latter surrounded by a cup formed of the thin coalescent paleæ. Pappus nearly as in C. Fremontii. Ray-achenium rather acute at the bare, but the summit not at all apiculate.

BAILEYA MULTIRADIATA, *Harv. & Gray, l. c.; Pl. Wright. l. c.* Sandy places, with the same range as the foregoing, which may probably pass into it.

MATRICARIA DISCOIDEA, *DC. Prodr.* 6, *p.* 37; *Torr. & Gray, Fl.* 2, *p.* 413. A common weed in the streets of Monterey and elsewhere in California, appearing as if introduced; *Parry.*

ACHILLEA MILLEFOLIUM, *Linn.* Cobre, New Mexico; *Bigelow, Wright.*

VARILLA TEXANA, *Gray, Pl. Wright.* 1, *p.* 123. Plains and grassy places near Eagle Pass on the Rio Grande; *Bigelow, Parry, Thurber.*

ARTEMISIA CALIFORNICA, *Less. in Linnæa,* 6, *p.* 523. San Diego and San Luis Rey, California, where it abounds exceedingly; *Parry, etc.*

ARTEMISIA DRACUNCULOIDES, *Pursh; Gray, Pl. Wright. l. c.* Hills at the Cobre, New Mexico; *Wright, Bigelow.* On the Pecos, Texas; *Thurber.*

ARTEMISIA CANADENSIS, *Michx.; Torr. & Gray, Fl.* 2, *p.* 417. With the last.

ARTEMISIA FILIFOLIA, *Torr.; Torr. & Gray, l. c.; Torr. in Marcy Rep. t.* 12. Common in bottom land, from below El Paso to the Cobre, etc.

ARTEMISIA LUDOVICIANA, *Nutt.; Torr. & Gray, l. c.* Very common, and in various forms; including A. Douglasiana and A. Mexicana.

GNAPHALIUM CALIFORNICUM, *DC. Prodr.* 6, *p.* 224. San Diego, California; *Thurber.*

GNAPHALIUM LUTEO-ALBUM, *Linn.* Sandy low places, from the Nueces and Rio Grande, Texas to Sonora.

GNAPHALIUM SPRENGELII, *Hook. & Arn.; Gray, Pl. Wright.* 1, *p.* 124, & 2, *p.* 99. Hills, etc., from the Limpio, Cobre, etc., to Sonora and California.

GNAPHALIUM LEUCOCEPHALUM, *Gray, Pl. Wright.* 2, *p.* 99. Bed of mountain torrents, near Santa Cruz, Sonora; *Wright, Thurber.*

GNAPHALIUM MICROCEPHALUM, *Nutt.? Gray, Pl. Wright. l. c.* Cobre, New Mexico; *Wright.*

GNAPHALIUM PALUSTRE, *Nutt.; Torr. & Gray,* 2, *p.* 427. California; *Rev. Mr. Fitch,* etc. On the Colorado of the West; *Schott.*

ANTENNARIA DIOICA, *Gærtn.* Cobre, New Mexico; *Bigelow.*

FILAGO CALIFORNICA, *Nutt.; Torr. & Gray, l. c.* San Isabel, California; *Thurber.* On the Sacramento; *Rev. Mr. Fitch.*

CROCIDIUM MULTICAULE, *Hook. Fl. Bor.-Amer.* 1, *t.* 118. On the upper Sacramento, California; *Dr. Stillman.*

ARNICA DISCOIDEA, *Benth. Pl. Hartw. p.* 319. Monterey, California, in woods and ravines; May; *Parry.* A form with even the upper leaves all opposite or nearly so.

BARTLETTIA SCAPOSA, *Gray, Pl. Thurber, p.* 323. On a prairie near Corralitas, Chihuahua; August; *Thurber.*

PSATHYROTES ANNUA, *Gray, Pl. Wright.* 2, *p.* 100, & *Pl. Thurber, p.* 323. Bulbostylis (Psathyrotes) annua, *Nutt. Pl. Gambell.* Tetradymia (Polydymia) ramosissima, *Torr. in Emory, Rep. p.* 145. Colorado desert, California; *Schott.* Big-horn mountain, on the Gila; *Thurber.* "Flowers bright yellow. Foliage aromatic."

PSATHYROTES SCAPOSA, *Gray, Pl. Wright.* 2 *p.* 100, *t.* 13. Gravelly hills near El Paso, and Santa Maria, Chihuahua; *Wright, Bigelow.* Kioway crossing of the Rio Grande, near the Chisos mountains; *Parry.*

HAPLŒSTHES GREGGII, *Gray, Pl. Fendl. p.* 109. Along the Rio Grande below El Paso; *Parry,*

Bigelow. The accessory nerves are wanting in the disk-corollas of Dr. Bigelow's specimens, and the rays are narrower and entire, not three-toothed as in Gregg's.

SENECIO MULTILOBATUS, *Torr. & Gray, in Pl. Fendl. p.* 109. Monterey, California, May; *Parry.*

SENECIO CORONOPUS, *Nutt.; Torr. & Gray, Fl.* 2, *p.* 437. San Luis Rey, February, on dry hill sides; *Parry.*

SENECIO TAMPICANUS, *DC. Prodr.* 6, *p.* 427. On the Limpio, Smith's Run, Rock Creek, White Rock Mountains, near the Rio Grande, etc.; *Bigelow, Wright, Parry.*

SENECIO LOBATUS, *Pers.* Low banks or beds of rivers, from Laredo to Frontera and the Santa Maria in Chihuahua.

SENECIO RIDDELLII, *Torr. & Gray, Fl.* 2, *p.* 444. On the Lower Rio Grande; *Schott.*

SENECIO LONGILOBUS, *Benth. Pl. Hartw. p.* 18. Gravelly hills, Arroyas, etc., on the Rio Grande above Presidio, to Chihuahua and Sonora. In very various forms.

SENECIO FILIFOLIUS, *Nutt.; Torr. & Gray, l. c.* On the Leona and Nueces, Texas.

SENECIO AUREUS, *Linn.*, var. BOREALIS, *Torr. & Gray, l. c.* Organ Mountains; *Wright, etc.*

SENECIO CANUS, *Hook.*, var. PYGMÆA, foliis angustissimis. Cobre, on mountains and hill sides; *Thurber, Bigelow.*

SENECIO FASTIGIATUS, *Nutt.; Gray, Pl. Wright.* 2, *p.* 99. Cobre, Mimbres, etc., New Mexico; *Wright, Bigelow, etc.*

SENECIO PARRYI (sp. nov.): herbaceus, viscoso-pubescens; caule striato; ramis oligocephalis; foliis argute inæqualiter dentatis, caulinis spathulatis inferne longe attenuatis basi dilatata auriculato-amplexantibus, ramealibus summis lanceolatis; bracteis setaceo-subulatis; capitulis breviter pedunculatis; involucri (semipollicari) paucibracteolati squamis acuminatis; ligulis 12–15; acheniis sericeo-cinereis —In live-oak groves, 150 miles above the mouth of the Pecos, on the Mexican side of the Rio Grande, November; *Parry.* Root not seen. Stem, etc., slightly floccose when young. Cauline leaves 2 inches or more in length. Ligules oblong, yellow, half an inch long.

CACALIA DECOMPOSITA, *Gray, Pl. Wright.* 2, *p.* 99. Mountains east of Santa Cruz, Sonora; *Wright.*

CENTAUREA AMERICANA, *Nutt.* Sandy soil etc. from the Lower Rio Grande to Chihuahua. C. Mexicana, *DC.*, is the same thing.

CIRSIUM WRIGHTII, *Gray, Pl. Wright.* 2, *p.* 101. Around springs, San Bernardino, New Mexico; *Wright.* Comanche springs; *Bigelow.*

CIRSIUM VIRGINIANUM, *Michx.* var. Low grounds, Escondido springs; *Wright.* Rio Grande; *Schott, etc.*

CIRSIUM UNDULATUM, *Nutt; Gray, Pl. Wright. l. c.* W. Texas to the Limpio, and to Sonora, etc. In various forms, probably including C. ochrocentrum, *Gray, Pl. Fendl. p.* 110, *& Pl., Wright,* 2, *p.* 101.

CIRSIUM NEO-MEXICANUM, *Gray, Pl. Wright.* 2, *p.* 101. Organ mountains and Cobre, New Mexico; *Wright, Bigelow.* Cooke's spring; *Thurber.*

CIRSIUM GRAHAMII, *Gray, Pl. Wright.* 2, *p.* 102. In swamps, between the Sonoita and San Pedro, Sonora; *Wright, Thurber.*

CIRSIUM COULTERI, *Harv. & Gray, Pl. Fendl. p.* 110? Monterey, California; *Parry.*

MOQUINIA HYPOLEUCA, *DC. Prodr.* 7, *p.* 22. Mountain pass, near Parras, *Thurber.* This is No. 1391 and 2358 of Berlandier's collection, who records its vernacular name as "Ocotillo."

TRIXIS FRUTESCENS, *P. Browne; DC. Prodr.* 7, *p.* 68; var. angustifolia, et foliis sericeo-

pubescentibus, argute denticulatis; involucri superne sensim attenuatis acutis.—Among rocks, Bachimba, Chihuahua; *Thurber*. Ringgold's Barrack, on the Rio Grande, Texas; *Schott*. Var. ANGUSTIFOLIA; foliis lato vel angusto-lanceolatis margine plerumque revolutis subsericeis sæpius integerrimis. T. angustifolia, *Gray, Pl. Wright.* 1, *p.* 128, & 2, *p.* 102. Ravines, Santa Cruz, Sonora; El Paso and Flounce mountains, New Mexico; *Wright, Parry, Bigelow*. Schultz, Bip. (in *Botany of the Herald, p.* 314) refers these all to T. frutescens, which may well be the case if that species includes forms with thickish and silky pubescent leaves as well as tapering acute scales of the involucre; but, on the other hand these narrow-leaved varieties quite as clearly run into T. angustifolia, *DC.* (Berlandier's No. 1284 and 1353,) which Schultz keeps separate. The latter belong to an arid region, and certainly look widely different from Berlandier's No. 2100 and 2230, which I had supposed to answer to the type of T. frutescens.

PEREZIA THURBERI, *Gray, Pl. Thurber, p.* 324. Rocky hills, near Santa Cruz, Sonora; *Thurber*. Dr. Schultz has recently referred Perezia to Trixis, perhaps with reason, as it is difficult to draw a limit between them.

PEREZIA WRIGHTII, *Gray, Pl. Wright.* 1, *p.* 127. On the Rio Grande, Rio Frio, Limpio, etc.; *Wright, Bigelow, Parry, Schott, Thurber*.

PEREZIA NANA, *Gray, Pl. Fendl. p.* 111, & *Pl. Wright. l. c.* Gavelly or rocky hills, from the Rio Grande, Texas, to the San Pedro, Sonora. The name is not always appropriate, as the plant is sometimes a foot high.

PEREZIA RUNCINATA, *Gray, l. c.* From the lower Rio Grande to Chihuahua. The fascicled roots become tuberous-thickened below, like those of a Peony or Dahlia.*

LERIA NUTANS, *DC.* Western and southern Texas, to the Rio Grande.

CALAIS LINEARIFOLIA, *DC. Prodr.* 7, *p.* 85; *Gray, Pl. Wright.* 2, *p.* 102. Near San Diego, California; *Parry*. New Mexico on the Rio Grande, Organ mountains, and Lake Gusman; *Wright, Bigelow*. Guadalupe cañon, Sonora; *Capt. Smith*.

CALAIS PARRYI, (*Gray, in Bot. Whippl. Rep. p.* 112, *adn.*): scaposa, fere glabra; foliis lineari-lanceolatis sæpius pinnatifido-laciniatis; involucri squamis triseriatis ovatis oblongisve subobtusis, exterioribus gradatim brevioribus; ovariis lævibus; pappi paleis oblongis apice bifidis arista e sinu exserente barbellato-scabra dimidio brevioribus.—Near San Diego, California; March; *Parry*. The specimens are too young to give the complete characters. The plant belongs to the section *Calocalais*, and in the pappus most resembles C. macrochæta, *Gray, Pl. Fendl.*; but the scales of the involucre are much broader and blunt, and the awn of the pappus is shorter and more denticulate; the leaves also are shorter and mostly obtuse. In C. macrochæta, the scales of the involucre are lanceolate and gradually very taper-pointed; and the slender awn is scarcely scabrous.

CALAIS DOUGLASII, *DC. Prodr.* 7, *p.* 85. Near San Diego, California, March; *Parry*. Very

*In Berlandier's *reliquiæ* I find still another Perezia viz:

PEREZIA THYRSOIDEA (sp. nov.): glanduloso-scabrida; ramis floridis strictis; foliis confertis subimbricatis oblongis ovatisve utrinque angustatis pungenti-acutis basi sessili vix aut ne vix amplexicaulibus; [illegible]is sinuloso-serrulatis reticulatis subtus præsertim glanduloso-puberulis; ramulis 3–5-cephalis brevibus folia parva integerrima bracteiformia gerentibus in thyrsum elongatum spiciforme congestis; involucro cylindrico 10–12-floro; squamis lineari-lanceolatis sensim subulato-acuminatis appressis, intimis pappo rigidulo copioso (haud clavellato) æquilongis.—Guanaxuato, Mexico, No. 1329. Base of the stem not seen, nor the leaves much below those which bear flowering branchlets in their axils. Lowest leaves seen 2½ inches long, gradually decreasing to an inch, and shorter than the flowering branchlets they subtend; these altogether form a dense and elongated thyrsus of a foot or so in length. Heads 9 or 10 lines long. Scales of the involucre glandular, imbricated in several series, the exterior passing into bractlets. Pappus whitish, pluriserial. This can hardly be the Perezia moschata of Lallav. and Lex., or any other described species.

small and imperfect specimens. Exterior achenia hirsute, as stated by Nuttall, not the inner, as described by Hooker and Arnott.

CALAIS PLATYCARPHA (*Gray, in Bot., Whippl. Rep. p.* 113 & 114,): scaposa; foliis pinnatipartitis (vel integris?) glabris; involucro calyculato; acheniis immaturis brevibus truncatis, paucis extimis villosis; pappi paleis orbiculatis seu latissime ovalibus integerrimis apice subito brevi-aristatis.—On clay hills, San Luis Rey, California; *Parry*. The specimen, although too young, affords characters which well distinguish this from the cognate C. Douglasii. The leaves are cut into numerous short and crowded lobes, and are as long as the young scapes. Involucre only 4 lines long, consisting of 8 or 10 oblong and rather obtuse scales of equal length, and of a few short calyculate scales. The young achenia are oblong, rather clavate, and largest at the truncate apex; it is not likely that they become rostrate or even tapering at the apex. Some of the exterior ones are hairy, more so than in C. Douglasii; the others are glabrous, except a minute papillose pubescence on the ribs. Paleæ of the pappus 5, nearly 3 lines long, fully 2 lines wide, entire, the midrib abruptly exserted into a scabrous awn of only one-third the length of the scale itself.

HEMIPTILIUM, Nov. Gen.

Capitula et habitus Stephanomeriæ. Achenia angulata, utrinque truncata, costata, costis 5—10 tuberculatis. Pappus 5–15-paleatus; paleis lineari-lanceolatis vel setiformibus inferne nudis, apicem versus breviter plumosis.—Herbæ graciles, annuæ vel biennes, glabræ, paniculato-ramosissimæ; ramis fere aphyllis; floribus roseis? Species 2, nempe:

HEMPTILIUM SCHOTTII (sp. nov.): capitulis parvis 5-floris; acheniis 5–6-angulatis pluricostatis, costis tuberculoso-scabris; pappi paleis 5–6 rigidis lineari-lanceolatis obtusiusculis achenio haud longioribus infra medium nudis marginibus leviter scariosis.—Camp Miller, valley of the Gila; May, 1855; *Schott*. Only branchlets or branches were collected; these bear merely small subulate bracts in place of leaves, and racemose-panicled small heads. Involucre only 3 lines long. Branches of the style clavate, glabrous. Color of the flowers not recorded. Achenia 1½ line long: pappus of rigid paleæ, persistent or nearly so; the plumose hairs borne at the upper part not much longer than the breadth of the palea. The plant resembles Stephanomeria paniculata in aspect.

HEMIPTILIUM BIGELOVII (sp. nov.): caule paniculato-ramosissimo e radice annua seu bienni; foliis radicalibus linearibus subpinnatifidis, rameis vix ullis; capitulis 6–9-floris; acheniis 5-costatis, costis validis rugoso-tuberculatis; pappo achenio duplo longiore e setis fragilibus 12–15 basi dilatatis rariter denticulatis vel setulosis medio gracillimis nudis versus apicem barbellato-plumosis.—Frontera, New Mexico; *Bigelow*. Plant with the aspect of Stephanomeria minor, (with which it has probably been confounded,) but perhaps more upright. Involucre 4 or 5 lines long; the ligules exserted to about the same length, apparently white or rose-color. Achenia with thick corky ribs, or strong angles. Pappus white, fragile, at the summit appearing like that of a Stephanomeria, although rather less plumose, but naked below, and paleaceous at the base.

STEPHANOMERIA MINOR, *Nutt.; Gray, in Whippl. Rep. p.* 114. S. minor & S. runcinata, *Nutt.; Gray, Pl. Wright.* etc. Gravelly and rocky soil, from the Pecos, western Texas, to the Colorado of the West.

STEPHANOMERIA THURBERI, *Gray, Pl. Thurber, p.* 325. Sierra de los Animos, Sonora; *Thurber*. On the Santa Cruz river; *Captain Smith*. Near the Cobre and Mimbres, New Mexico; *Bigelow*,

Dr. Henry. Heads large, 17–20-flowered, with pink and fragrant flowers. Bristles of the pappus 25–30.

RAFINESQUIA NEO-MEXICANA, *Gray, Pl. Wright.* 2, *p.* 2, *& p.* 103. Gravelly hills near El Paso, etc., New Mexico; *Bigelow, Wright, Parry.* Cook's Spring; *Bigelow.*

RAFINESQUIA CALIFORNICA, *Nutt. in Trans. Amer. Phil. Soc.* 7, *p.* 429. (TAB. XXXIV.) Oak groves, Monterey, California; *Parry.* Found also by Frémont on the Mohave river and in other parts of California. Some of the mature achenia (usually the exterior ones) have a mottled appearance, as represented in one of the figures.

CALYCOSERIS PARRYI (sp. nov.): involucro polyphyllo subimbricato; floribus flavis; acheniis longe rostratis, costis lævibus acute trinervatis.—Mountains east of Monterey, California; June; *Parry.* Only a single specimen was gathered, and that consists merely of the upper part of the plant, with reduced foliage. It is most interesting, however, as adding a second species to the genus Calycoseris, being a strict congener of the New Mexican C. Wrightii. It is distinguished by its yellow flowers, rather larger heads, more numerous scales to the involucre, of which there are likewise a few external and shorter scales, effecting a transition into the smaller calyculate ones, which are more pointed and mostly squarrose-recurved; the scales, as well as the peduncles and branchlets, are more conspicuously beset with similar setose-pedicellate glands, which here are blackish. More important characters are afforded by the achenia; these are more slender and rather longer; the strong ribs are not so thick, and are smooth or even, (while in C. Wrightii they are tuberculate-roughened, a character by no means sufficiently represented in the plate,) each with a sharp and salient dorsal nerve or keel, and with a less conspicuous lateral one on each side; and the slender beak is as long as the body of the achenium.

CALYCOSERIS WRIGHTII, *Gray, Pl. Wright.* 2, *p.* 104, *t.* 14. Low hills and alluvial banks of the Rio Grande, and elsewhere in New Mexico; gathered by all the collectors. Guadalupe cañon, Sonora; *Capt. Smith.*

PINAROPAPPUS ROSEUS, *Less.* Not rare in western and southern Texas, in Sonora, etc.

MALACOTHRIX CALIFORNICA, *DC. Prodr.* 1, *p.* 192. In rather dry grassy places, Monterey, California; *Parry.*

MALACOTHRIX? COULTERI, *Harv. & Gray, Pl. Fendl. p.* 113, *adn.* On the Sacramento? California; *Rev. Mr. Fitch.* One or two small bunches merely, throwing no more light upon this plant.

MALACOTHRIX OBTUSA, *Benth. Pl. Hartw. p.* 321. Monterey, California; *Parry.*

MALICOTHRIX TENUIFOLIA, *Nutt. in Trans. Amer. Phil. Soc. n. ser.* 1, *p.* 435, ex char. Valley of the Gila, at Camp Miller; May, 1855; *Schott.* The same as Coulter's No 246, and apparently Nuttall's plant. But it is herbaceous, except perhaps the very base, and the nascent shoots and young involucral scales are canescent with a stellate tomentum, which is soon deciduous. From three to five of the bristles of the pappus are more persistent and naked.

MALACOTHRIX FENDLERI, *Gray, Pl. Wright.* 2, *p.* 104. Along the Rio Grande, at El Paso, and elsewhere; *Bigelow, Wright,* etc. Guadalupe cañon, Sonora; *Capt. E. K. Smith.*

PYRROPAPPUS CAROLINIANUS, *DC. Prodr.* 7, *p.* 44. From the lower Rio Grande, Texas, to the Santa Cruz river, Sonora; *Schott, Capt. Smith.*

MACRORHYNCHUS HETEROPHYLLUS, *Nutt.; Gray in Whippl. Rep. p.* 115. M. Californicus, *Torr. & Gray.* (Cryptopleura Californica, *Nutt.*) M. Chilensis, *Hook. & Arn.* Monterey and elsewhere in California; *Parry,* etc.

MACRORHYNCHUS LESSINGII, *Hook. & Arn. Bot. Beech. p.* 361. Sea-beach at Monterey, California; April; *Parry.* The specimen is in too early a state for proper investigation, but it has a thick root, and very obtuse or rounded exterior scales of the involucre. Perhaps M. grandiflorus, *Nutt.* (which is known only in fruit) is a fully developed state of it.

PRENANTHES? EXIGUA, *Gray, Pl. Wright.* 2, *p.* 105. Hills near El Paso, etc.; *Wright, Bigelow.*

LYGODESMIA APHYLLA, *DC.*, var. TEXANA, *Torr. & Gray, Fl.* 2, *p.* 485. Common on plains from San Antonio, Texas, nearly to the Rio Grande, New Mexico. The stems bear long leaves towards the base.

MULGEDINUM PULCHELLUM, *Nutt.; Torr. & Gray, l. c.* Plains, from the Limpio to the Rio Grande, and Cobre, New Mexico.

SONCHUS OLERACEUS, *Linn.* Alluvial borders of the Rio Grande; *Schott, Bigelow.*

SONCHUS ASPER, *Vill.* Along the Gila; *Schott.* Cobre, New Mexico; *Bigelow.*

CREPIS AMBIGUA, *Gray, Pl. Fendl. p.* 114, & *Pl. Wright.* 2, *p.* 106. Organ mountains, New Mexico; *Wright.*

HIERACIUM LONGIPILUM, *Torr.*; *Torr. & Gray, Fl.* 2, *p.* 477. White-Rock mountain, head of Rock creek, western Texas; *Bigelow;* July.

LOBELIACEÆ.

LOBELIA PECTINATA, *Engelm. in Wisliz. Rep. p.* 108. L. fenestralis, *Cav.?* Sonora, September; *Thurber, Schott.* (No. 420 and 1430, *Wright.*) The plant of Cavanilles is said to be perennial, while ours is certainly annual.

LOBELIA BERLANDIERI, *Alph. DC. Prodr.* 7, *p.* 367. On the lower Rio Grande, Chihuahua, Neuvo Leon, etc. (No. 419 and 1429, *Wright.* No. 3177, *Berlandier,* Matamoras.) Annual, smooth. Stem erect, or sometimes apparently prostrate, more or less branching, mostly naked above. Lowest leaves broadly ovate or obovate, tapering at the base into a petiole; upper ones sessile, ovate and oblong-lanceolate, irregularly and acutely toothed. Flowers in lax racemes terminating the branches; the pedicels 2–4 lines long and twice the length of the linear bracts. Calyx about two thirds as long as the tube of the corolla, the segments subulate and denticulate. Corolla blue, 3–4 lines long; upper segments oblong-lanceolate; lower ones much narrower; the tube about as long as the stamina. Wright's 419 and 1429, differ in being more leafy above, and in the shorter pedicels. We suspect they are all forms of L. Cliffortiana.

LOBELIA PUBERULA, *Michx. Fl.* 2, *p.* 152. Near Victoria, Texas. This is the same as No. 42 of Drummond's 3d Texan collection, which Alph. DC, refers to L. amœna.

LOBELIA LAXIFLORA, *H. B. K.* 3, *p.* 311. L. fissa, *Roem. & Schultes.* Mabibi, Sonora; June; *Thurber.* About a foot and a half high. Leaves 3–5 inches long, lanceolate, acute at each end; the lower ones remotely and obscurely denticulate; the upper minutely and sharply serrulate. Raceme few-flowered. Pedicels an inch or more in length. Flowers nearly as large as in L. cardinalis. Segments of the calyx triangular-lanceolate, scarcely longer than the hemispherical tube. Corolla dull red; the tube three times as long as the calyx. Stamineal column considerably exserted.

LOBELIA CARDINALIS, *L. Sp. p.* 1320. L. Texensis, *Raf.* Leon Spring, Devil's river, and Head of the Nueces, western Texas; also on the Mimbres, Neuvo Mexico; *Bigelow.* The flowers are sometimes smaller than in the northern plant; in which state it seems to be hardly distinct from L. Texensis, *Raf.*, except in the narrower flowers, and usually shorter sepals.

NEMACLADUS RAMOSISSIMUS, *Nutt. in Trans. Amer. Phil. Soc. n. ser.* 8. *p.* 254. (Tab. XLV.) Hill sides, Frontera, on the upper Rio Grande; also in Chihuahua, and near the Pimos villages, on the Gila; *Parry.* (No. 1428 and 1431, *Wright.*) We have specimens from California, collected by Dr. *Andrews* and *Rev. Mr. Fitch.* Mr. Nuttall considers this remarkable plant as the type of a distinct natural order which ought to be placed between Lobeliaceæ and Goodenoviaceæ; but we think it should certainly be referred to the former, notwithstanding the non-cohering anthers. The stigma is destitute of an indusium, and even of a hairy fringe.

CAMPANULACEÆ.

DYSMICODON PERFOLIATUM, *Nutt. l. c.* Campanula perfoliata, *Linn.* Copper Mines and Rio Mimbres, New Mexico; April–June; *Bigelow.* Cañon of Guadalupe, Sonora; *Capt. E. K. Smith.*

DYSMICODON OVATUM, *Nutt. l. c.* On the lower Rio Grande; April; *Schott.* Bexar, Texas; *Berlandier*, No. 368.

CAMPYLOCERA LEPTOCARPA, *Nutt., l. c.* First crossing of the Rio San Pedro, Texas; May–June; *Bigelow.*

CAMPANULA ROTUNDIFOLIA, *Linn. Sp. p.* 239. Rocks on the Rio Grande, 150 miles above the mouth of the Pecos; November; *Parry.* The radical leaves are ovate and acute, but there can be little doubt of the plant being a form of C. rotundifolia.

ERICACEÆ.

ARCTOSTAPHYLOS PUNGENS, *H. B. K. Nov. Gen. & Sp.* 3, *p.* 278; *Torr. in Emory, Rep. t.* 7, *& in Bot. Whipp. Rep., p.* 116. Dry pine woods, near Monterey, in the same State; *Parry.* Mountain sides and dry ravines, San Luis, etc., Sonora; *Capt. E. K. Smith; Schott, Thurber.* Mexico; *Berlandier*, No. 1318. Sometimes procumbent. Flowers rose-color.

ARCTOSTAPHYLOS TOMENTOSA, *Dougl.; DC. Prodr.* 7, *p.* 585; *Torr. l. c.* San Luis Obispo, California; April; *Parry.* Also in Napa county; *Thurber.* It is called *Mansinita*, (little apple,) by the Mexicans of California. The red berries are used by the Spanish natives to make a cooling sub-acid drink.

ARCTOSTAPHYLOS POLIFOLIA, *H. B. K. Nov. Gen., & Sp.* 3, *p.* 277. Lower California, near the boundary line. A shrub, about six feet high, with dark purple berries, which become black in drying.

ARBUTUS MENZIESII, *Pursh, Fl.* 1, *p.* 282. Mountains at the head of Rock creek; *Bigelow.* (No. 1433, *Wright.*) Only 12–15 feet high, and with smaller leaves than in the Oregon and California plant. In California, where it is common, it is a most beautiful tree, often 40 feet or more in height, and is known by the name of Madronia. The wood is used for making the heavy wooden stirrups of the Mexicans.

GAULTHERIA SHALLON, *Pursh, Fl.* 1, *p.* 284, *t.* 12. Pine woods near Monterey and in other parts of California; *Parry.* The aromatic acid berries are rather agreeable to the taste.

VACCINIUM OVATUM, *Pursh, Fl.* 1, *p.* 290; *Lindl. Bot. Reg. t.* 1354. Pine woods near Monterey, California; *Parry.* A neat evergreen shrub, 2–3 feet high. The berries are edible, but small.

STYRACEÆ.

STYRAX CALIFORNICUM, *Torr. Pl. Frém. in Smithson. Contrib. vol.* 6. Valley of the Sacramento.

EBENACEÆ.

DIOSPYROS TEXANA, *Scheele in Linnæa.* 22, *p.* 145. Hill sides, Fort Inge to Escondido creek, and near Eagle Pass, western Texas; *Schott, Parry.* Flowers in March. Fruit ripe in August, about an inch in diameter.

SAPOTACEÆ.

BUMELIA RECLINATA, *Vent. Ch. Pl. t.* 22, *fide Alph. DC. Prodr.* 8, *p.* 190: var. fructibus majoribus; floribus fasciculis numerosioribus. On the Rio Grande, from Laredo to the mouth of the river; *Schott.* Hills and plains near Live Oak creek; *Bigelow.* No. 1434, *Wright.* Matamoras; *Berlandier*, Nos. 1513, 3012 and 3048. A tree 25–30 feet high. It seems to differ from the plant of the Southern Atlantic States chiefly in the larger and more fleshy fruit. This is oblong, nearly three-fourths of an inch in length, sweet and edible. Testa smooth and shining, mottled with brown. Cotyledons united, thick and fleshy. Albumen wholly wanting.

THEOPHRASTACEÆ.

JACQUINIA PUNGENS, *Gray, Pl. Thurb. in Mem. Amer. Acad. Art. & Sc. n. ser.* 5, *p.* 325. Hills between Rayon and Ures, Sonora; *Thurber.* Perhaps a variety of T. macrocarpa, *Cav.*

PLANTAGINACEÆ.

PLANTAGO MAJOR, *Linn. Sp., p.* 163. Banks of the Acequia, near El Paso; May; *Bigelow.* (No. 1441, *Wright.*) Probably introduced among agricultural seeds by the early Mexican settlers.

PLANTAGO PATAGONICA, var. GNAPHALIOIDES, *Gray in Torr. Bot. Whipp. Rep. p.* 117, *& Man. Bot. ed.* 2, *p.* 269. P. gnaphalioides, *Nutt. Gen.* 1, *p.* 100. Western Texas, New Mexico, Sonora and California. Var. spicis oblongis vel capitatis. Dry hills, Sonora; *Schott.* San Diego, California; *Parry.* (No. 1438, *Wright.*)

PLANTAGO VIRGINICA, *Linn. Sp., p.* 163. Sandy banks of the Rio Grande, Eagle Pass, etc. Also in Sonora; *Schott.*

PLUMBAGINACEÆ.

STATICE LIMONIUM, *Linn. Sp., p.* 394. Saline soils, western Texas, and on the Rio Grande near its mouth; *Bigelow, Schott.* Salt places near San Diego, California; *Parry.*

PRIMULACEÆ.

ANDROSACE OCCIDENTALIS, *Pursh, Fl.* 1, *p.* 137; *Nutt. Gen.* 1, *p.* 118. Mule Spring and Cook's Spring, western Texas; April; *Bigelow.* Tubac, Sonora; March; *Parry.*

SAMOLUS VALERANDI, *Linn.*, var. AMERICANUS, *Gray Man. ed.* 2, *p.* 274. S. floribundus, *H. B. K. Nov. Gen. & Sp.* 2, *p.* 224. Low places, borders of the Limpio; July, *Bigelow.* Banks of streams, Sonora, May; *Capt. E. K. Smith.* California; *Parry.*

SAMOLUS EBRACTEATUS, *H. B. K., l. c. p.* 223, *t.* 129. Common along the Rio Grande from El Paso to the Gulf, and on the seacoast of Texas.

DODECATHEON MEADIA, *Linn. Sp. p.* 207; *Torr. in Bot. Whippl. Rep., p.* 118. Grassy places near Monterey and other places in California; March to April; *Parry.* This includes D. integrifolium, *Michx.*, and even D. frigidum, *Cham.*

LENTIBULACEÆ.

UTRICULARIA GIBBA, *Linn. Sp. p.* 26. In the San Pedro river, also in Elm creek, and near the head waters of the Nueces, western Texas, October; *Bigelow.*

BIGNONIACEÆ.

TECOMA STANS, *Juss. Gen. p.* 139; *DC. Prodr.* 9, *p.* 225. Hills along the Rio Grande, from El Paso downward and westward to Sonora; May to July. (No. 1446, *Wright.*)

CHILOPSIS LINEARIS, *DC. l. c. p.* 227. C. glutinosa, *Engelm. in Wilz. North. Mex., p.* 94. Hills and ravines along the Rio Grande, Santa Cruz river, etc., Sonora; *Schott* and *Capt. E. K. Smith.* San Felipe, California; *Parry* (No. 144?, *Wright*). A shrub usually 4–6 feet high, but Capt. Smith saw it in Sonora 25 feet high. I can distinguish but one species in the collections.

Suborder SESAMEÆ.

MARTYNIA VIOLACEA, *Engelm. in Wisliz. l. c. p.* 101. Low places and plains, near the Limpio, etc.; July; *Bigelow.* Near Laredo; *Schott.* Corallitas, etc., Chihuahua; *Thurber, Parry.*

MARTYNIA ARENARIA, *Engelm. l. c. p.* 100. Sandy places, from El Paso and near the Limpio (*Bigelow*) to the Presidio del Norte; July; *Parry.* Sonora; September; *Thurber.* "Plant viscid; corolla reddish-yellow externally, yellow inside; the throat mottled and veined with brown." *Thurber.*

OROBANCHACEÆ.

APHYLLON UNIFLORUM, *Torr. & Gr. in Gray's Man. Bot. ed.* 2, *p.* 281. Orobanche uniflora, *Linn.* California; *Rev. A. Fitch.*

APHYLLON FASCICULATUM, *Torr. & Gr. l. c.* Orobanche fasciculata, *Nutt. Gen.* 2, *p.* 59; *Hook. Fl. Bor.-Am.* 2, *p.* 93, *t.* 170. Tributaries of the Rio Yaqui, Sonora; June; *Thurber.* Mountains east of San Diego; June; *Parry.* Our numerous specimens show that the divisions of the calyx are variable in length and shape, so that the species is chiefly distinguished by its scaly stem and shorter peduncles.

PHELIPÆA LUDOVICIANA, *Walp.; Reuter in DC. Prodr.* 11, *p.* 11. Orobanche Ludoviciana, *Nutt.* On the beach at Brazos Santiago, Texas; May; *Schott.* Pachitiga, Chihuahua; August; *Thurber.*

PHELIPÆA COMOSA. Anoplanthus comosus, *Walp. Rep.* 3, *p.* 480, *& Reut. l. c.* Orobanche comosa, *Hook. Fl. Bor.-Am.* 2, *p.* 92, *t.* 169. California, probably on the lower Sacramento; *Shelton.* The specimens were parasitic on the roots of a species of Grindelia, apparently G. arguta. The calyx is deeply 5-parted, with nearly equal lanceolate-subulate segments. Bracteoles very remote from the flower, alternate on the pedicel, resembling the segments of the calyx. Lobes of the corolla all acute and entire; those of the upper lip ovate-lanceolate; of the lower linear-lanceolate.

SCROPHULARIACEÆ (by A. GRAY).

MAURANDIA ANTIRRHINIFLORA, *Willd. Hort. Berol. t.* 83. Common in the valley of the Rio Grande, and west to California.

MAURANDIA (EPIXIPHIUM) WISLIZENI (sp. nov. *Engelm.*): scandens, glabra; foliis hastatis; pedicellis axillaribus petiolo sæpiusque calyce brevioribus; corolla "pallide cærula," fauce pervia nuda; calyce fructifero demum subcoriaceo valde aucto et reticulato basi 5-angulato seu 5-carinato, lobis triangulari-lanceolatis sensim acuminatis; capsula ovoidea coriacea calyce inclusa stylo ensiformi rigido persistente cornuta, loculis juxta apicem rima transversali dehiscentibus; seminibus compressis ovalibus alatis disco paleaceo-rugosis.—Along the Rio Grande below Doña Ana, etc. This was first received in the collection of Dr. Wislizenus, and afterwards in that of Wright and most others from the northern borders of Mexico. Dr. Engelmann proposed it long ago, in MSS., as a new genus, under the name of *Epixiphium maurandioides*, which is here, with his permission, changed to Wislizeni, since I incline to view the plant as the type of a mere subgenus of Maurandia, freely admitting, however, that its characters are as well marked as those of Lophospermum. The remarkable fructiferous calyx is 8 or 9 lines broad at the base, strongly 5-angled and keeled, and an inch or an inch and a half long; the sword-shaped persistent style nearly equals the calyx-lobes, and the dehiscence is by a clean transverse chink on each side, which inclines to extend downwards so as to become valvular. Seeds blackish, distinctly winged, 1½ to 2 lines long.

ANTIRRHINUM NUTTALLIANUM, *Benth. in DC. Prodr.* 10, *p.* 592. San Diego, California; May–June; *Parry*. On the Great Colorado; *Schott*. Leaves of the branches mostly roundish-cordate. Segments of the calyx ovate, a little unequal. Persistent base of the style oblique.

ANTIRRHINUM COULTERIANUM, *Benth. l. c.* Near San Pasqual, California, May; *Thurber*. Mountains east of San Diego, June; *Parry*. Root annual. Stem 3 or 4 feet high, supporting itself on other plants by its twining slender branches. Raceme nearly a foot long: persistent base of the style oblique. This species is near A. majus.

LINARIA CANADENSIS, *Dum.; Benth. in DC. Prodr.* 10, *p.* 278. Near the Copper Mines, and on Rock creek, New Mexico; *Bigelow*. Monterey, California; *Parry*. Upper Sacramento; *Stillman*.

SCROPHULARIA COCCINEA (sp. nov.): glabra; foliis deltoideo-ovatis vel subcordatis acutis grosse dentatis, dentibus pauci-serratis; thyrso oblongo aphyllo; cymis plurifloris floribusque minutim glandulosis; calycis segmentis ovatis margine haud scariosis; corolla læte coccinea, lobis 2 posticis tubo ovato-oblongo gibboso dimidio breviore, anticis brevissimis; anthera sterili obovato.—At the base of a rocky ledge near the summit of a mountain, Santa Rita del Cobre, New Mexico; *Wright* (1470), *Bigelow*. What appears to be the same species in fruit was collected by Dr. Bigelow near the Organ mountains. A truly handsome species. Specimens raised from seeds in the autumn of 1852 (but which were unfortunately soon lost) displayed flowers as bright red as those of Stachys coccinea.

COLLINSIA BICOLOR, *Benth. in Hort. Trans. n. ser.* 1, *p.* 48, *& in DC. Prodr.* 10, *p.* 318. Oak woods near Santa Barbara, and San Diego, California; March; *Parry*.

PENTSTEMON AMBIGUUS, *Torr. in Ann. Lyc. N. Y. p.* 228, *& in Marcy's Rep. p.* 293, *t.* 16. Gravelly hill sides near Tascate; July; and Burro mountains; September; also near San Diego; *Bigelow*. Sand hills, Chihuahua; *Thurber* (742.) A common species in or near the southern Rocky mountains. In the figure cited above, the sterile filament is represented as bearing a small anther, to which no allusion is made in the letter-press. It is not found in the present specimens, but exists in all those collected by Captain Marcy. In this as in several species of the genus, either all four fertile stamens or the two posterior are often free from the corolla nearly or even quite to the base.

PENTSTEMON LINARIOIDES (sp. nov.): suffruticosus, pube minutissima glauco-cinereus, multicaulis; caulibus floridis simplicibus foliosis strictis (6–15-pollicaribus); foliis angustissime linearibus seu lineari-acerosis imisve spatulato-linearibus mucronatis integerrimis; racemo vel paniculo virgato laxiflоro; pedunculis alternis brevibus 1–5-floris; calycis segmentis ovatis vel ovato-lanceolatis acuminatis inferne scarioso-marginatis; corolla pallide cæruleo-purpurea superne ampliata breviter bilabiata, palato pl. m. barbato, lobis rotundatis subconformibus patentibus; antheris glabris subexsertis; filamento sterili longitudinaliter barbato.—Organ mountains; *Parry*. Copper Mines and Los Animos, New Mexico; *Wright*, (1472,) *Thurber*, (331, 1115,) *Bigelow*. Sierra San Luis, Chihuahua and Sonora; *Schott*. A well marked species, of the group to which the preceding belongs; the numerous flowering stems form a woody base; the foliage and inflorescence resembling one of the strict and narrow-leaved Linarias. Corolla 7 to 9 lines long.

PENTSTEMON JAMESII (*Benth. in DC. Prodr.* 10, *p.* 325): pumilus, strictus, puberulus; foliis nunc glabratis omnibus sessilibus plerisque parce denticulatis, caulinis floralibusque linearibus, imis et radicalibus sublanceolatis deorsum attenuatis; racemo 8–12-floro spicato; pedunculis alternis 1–2-floris seu pedicellis brevissimis cum sepalis e basi lata lanceolatis sensim acuminatis viscido-pubentibus; corolla (pallide purpurea) tubo angusto, fauce subito valde ampliata campanulata, lobis conformibus rotundatis; antheris glabris; filamento sterili longitudinaliter barbato.—Low places near the Limpio, July; *Bigelow*. This species may be described as intermediate between P. Cobæa and P. pumilus, *Nutt*. The specimens are only 5 or 6 inches high, herbaceous, erect, leafy; the leaves from 1½ to 2½ inches long, and 1½ to 2½ lines wide, thickish; the upper floral linear-subulate and not exceeding the calyx; the latter is half an inch long; the corolla, which has just the shape of that of P. Cobæa, is over an inch long. It is somewhat viscid externally and slightly bearded within the lower lip. Sterile stamen like that of P. Cobæa, but the beard denser.

PENTSTEMON STENOPHYLLUS (sp. nov.): glaberrimus; caule gracili 2–3-pedali; foliis linearibus elongatis integerrimis, floralibus lineari-setaceis; panicula laxiflora; pedunculis oppositis patentibus gracilibus 2–5-floris pedicellis 2–4-plo longioribus; calyce parce glanduloso-pubero, segmentis ovatis margine scariosis ciliato-denticulatis acuminatis, acumine patente; corolla infundibuliformi-ampliata (fere sesquipollicari cærulea?) vix bilabiata, lobis brevibus conformibus rotundatis; antheris rima hirto-ciliolatis; filamento sterili glaberrimo summo apice dilatato.—Hills between Babacomori and Santa Cruz, Sonora; *Wright*, (1477.) Radical leaves not seen; cauline all alike, but gradually smaller and narrower towards the summit of the virgate stem, the larger 4 inches long and 1½ or 2 lines wide, perfectly entire. Peduncles 1½ or 2 inches long. Pedicels 3 to 6 lines long. Calyx 2 or 3 lines long. This species belongs to the section *Cepocosmus*, and to the same group with P. imberbis. If, as seems likely, No. 186 of the collection of Wislizenus, from Cosiquiriachi, belongs here, the corolla is blue.

PENTSTEMON DASYPHYLLUS (sp. nov.): velutino-puberulus; caulibus e basi suffructicosa strictis; foliis lineari-lanceolatis imisve oblanceolatis integerrimis obtusis junioribus præsertim molliter velutinis, floralibus gradatim minoribus cum racemo simplici laxo paucifloro glanduloso-puberulentis; pedicellis alternis; sepalis ovato-oblongis obtusis; corolla ("purpureo-cærulea" fere sesquipollicari) ampliato-infundibuliformi vix bilabiata, lobis rotundatis subconformibus; antheris rima ciliolato-hirtellis; filamento sterili glaberrimo apice vix dilatato.—Stony hills of the Pecos, and Cook's Spring, New Mexico; *Wright*, (1478). Valley of the Santa Cruz river on mountain sides, and in the valley of the San Pedro, Sonora; *Capt. E. K. Smith, Bigelow & Thurber*. Also

collected by Dr. Woodhouse in Sitgreave's expedition. Stems 1 to 2 feet high, simple, virgate. Leaves 1 to 3 inches long, 1½ to 3 lines wide, thickish. Pedicels almost always simple and ebracteolate, 3–8 lines long. Calyx 2–3 lines long; corolla much as in the last; sterile filament shorter, and gradually very slightly dilated upwards. This is evidently most related to P. lanceolatus, *Benth.;* but is more downy, with simpler inflorescence; and the much larger and more dilated corolla is of a different color; being red in P. lanceolatus, according to Dr. Gregg's notes on a specimen gathered by him at Buena Vista.

PENTSTEMON VIRGATUS, (sp. nov.): glaber, seu minutissima glanduloso-puberulus; caule herbaceo simplici stricto; foliis lineari-lanceolatis acutis integerrimis, radicalibus spatulato-lanceolatis obtusis, floralibus gradatim in bracteas subulatas breves diminutis; panicula virgata elongata multiflora subsecunda; pedunculis plerumque oppositis 1–4-floris pedicellisque sæpissime floribus haud longioribus; sepalis ovato-rotundis margine subscariosis; corolla (roseo-lilacina venis intus purpureis) dilatato-infundibuliformi bilabiata, labiis æquilongis, superiore vix concavo bilobo, inferiore patente tripartito, lobis omnibus ovalibus conformibus; antheris glabris subexsertis; filamento sterili glaberrimo apice dilatato.—Santa Rita del Cobre, on the mountains; *Bigelow, Wright,* (1476;) also gathered by *Dr. Woodhouse.* A pretty species, which has been raised in the Cambridge Botanic Garden, from Mr. Wright's seeds. It is a foot or 18 inches high, including the virgate inflorescence of half that length. Leaves from 1½ to 4 inches long, and 1½ to 3 lines wide, usually tapering to both ends. Corolla two-thirds of an inch long. Anther-cells soon divaricate. According to Bentham's arrangement this belongs to the section Eupentstemon.

PENTSTEMON PUNICEUS (sp. nov.): glaberrimus, glaucus; caule herbaceo valido; foliis crassis, radicalibus obovatis, caulinis ovatis cordato-amplexicaulibus plus minusve connatis acutis integerrimis, floralibus parvis; panicula contracta virgata nuda interrupta; cymis subsessilibus multifloris; pedicellis gracilibus (flore fere æquilongis) nudis; sepalis ovalis obtusis; corolla infundibuliformi, limbo fere æqualiter 5-lobo, lobis rotundatis patentibus; antheris glabris, filamento sterili sub apice hinc barbato.—In the Guadalupe cañon, Sonora, June, 1851; *Thurber & Captain E. K. Smith.* This is apparently a large, and must be a strikingly handsome species, with its glaucous foliage and "brilliant scarlet" flowers. Lower leaves (with the base of the stem) wanting in my specimen; but those present show a tendency to be connate-perfoliate. Corolla less than an inch long; the throat moderately enlarged; lobes about 3 lines long.

PENTSTEMON PUNICEUS, var.? PARRYI: foliis superioribus (caet. ignotis) lanceolatis basi cordato-amplexicaulibus; cymis pedunculatis; floribus paullo minoribus; sepalis oblongis; filamento sterili sub apice hinc densissime barbato.—On the Rio Gila, March, 1852; *Parry.* The specimens gathered are merely two flowering summits; the color of the blossoms not recorded, nor positively to be made out. But its floral characters so nearly accord with the preceding that it must, for the present at least, be appended to it.

PENTSTEMON WRIGHTII, *Hook. Bot. Mag., t.* 4601. On rocky mountain sides near the head of the Limpio, June; *Wright,* (unnumbered.) Santa Cruz mountains and Los Nogales; *Captain E. K. Smith.* (The latter a somewhat remarkable form, but clearly of this species.) We have also had this pretty species in cultivation. The corolla is rich rose-color, as described in the letter-press, but with none of the deep red given in the figure in the Botanical Magazine.

PENTSTEMON SPECTABILIS (*Thurber, MSS.; Torr. & Gray, in Bot. Whipp. Pacif. Railroad*

Rep.) Mountains east of San Diego; *Parry*. San Pasqual, California; *Thurber, Schott*. Dry ravines, Organ mountains, New Mexico; *Bigelow, Wright*, (1475.) These specimens of this well-marked and showy species, though not displaying such an ample panicle of flowers as do the Californian ones from Thurber and Mr. Wallace, evidently belong to the same species. It pertains to the section Cepocosmus.

PENTSTEMON FENDLERI, *Gray, in Bot. Pope's Rep. p.* 12, *t.* 5. Common apparently, from the Platte through New Mexico and the Rocky mountains to Chihuahua, (*Wislizenus*, No. 245,) and brought by all the collectors. It is Fendler's No. 576, and Wright's 1473. (This clearly is not distinct from P. cyananthus, *Hook. Bot. Mag.*, *t.* 4464, which was overlooked when P. Fendleri was characterized; it must accordingly bear that name.)

PENTSTEMON GRACILIS, *Nutt. Gen. p.* 52. Near the Guadalupe river, above Victoria, Texas; *Schott*.

PENTSTEMON DIGITALIS, *Nutt. in Trans. Amer. Phil. Soc. n. ser.* 5, *p.* 181. Rio Hondo, Texas; *Wright*.

PENTSTEMON BARBATUS, *Nutt.; Benth. in DC. Prodr.* 10, *p.* 329. P. Torreyi, *Benth. l. c. p.* 324. Common in New Mexico, along the mountains; *Fendler*, (581,) *Wright*, (440, 1474); *Bigelow*, etc. Santa Cruz mountain; *Captain E. K. Smith*. We have this in cultivation from Mr. Wright's seeds. It is hardy at Cambridge, and is taller (4 to 6 feet high) than the commonly cultivated P. barbatus, as well as fuller-flowered; the virgate panicle becoming 2 or 5 feet in length, and bearing a long succession of fine scarlet blossoms, in some plants of the most brilliant hue. The calyx-segments are either marginless or slightly margined. The lower lip of the corolla at the throat is bearded, either somewhat copiously or sparingly, or in some plants the beard wholly disappears, so that the name *barbatus* is not characteristic of this species. But that all our forms are specifically identical with the old Chelone barbata I cannot doubt. In establishing his P. Torreyi, Mr. Bentham, who is generally so very accurate, has made two mistakes; the first, into which he was naturally led by the imperfection of the original specimens, was in referring his plant to the section Cepocosmus, and comparing it with P. imberbis, whereas it is a genuine Elmigera, having the upper lip erect, concave, and moderately two-lobed, the lower 3-parted and reflexed; the second in attributing to P. barbatus a bearded sterile filament, whereas it has always been described as with a naked one, conformably to the distinction formerly taken in this respect between Chelone and Pentstemon.

PENTSTEMON BARBATUS, var. PUBERULUS. Guadalupe cañon, May, 1851; *Thurber*. In every respect it is P. barbatus, but with a minute pubescence on the stem and leaves.

PENTSTEMON BACCHARIFOLIUS, *Hook. Bot. Mag.*, *t.* 4627. Rocky bluffs at the Big Bend of the San Pedro river, Texas; *Wright*, (439, 1479.) This showy species has been found only by Mr. Wright, who discovered it in 1849. From seeds gathered by him it has been raised both in England and in the Cambridge Botanic Garden. Overlooking Hooker's publication of the species, I had named it P. Grahami, in compliment to Colonel Graham, United States Topographical Engineers, under whose command Mr. Wright was when he, for the second time, met with the plant; but the name has not appeared in print, so far as I am aware. The figure in the Botanical Magazine does feeble justice to the very deep and carmine corolla, and represents the plant as coarser and the leaves as considerably larger than usual. The latter in the wild specimens are only ½—1 inch long, and very thick and firm. Far from being "annual?" the plant is shrubby. The upper lip of the corolla is erect or at length somewhat recurved; the

lower shorter, 3-parted and recurved. The plant is ambiguous between the sections Cepocosmus and Elmigera.

PENTSTEMON CORDIFOLIUS, *Benth. Scroph. Ind. p. 7, adnot & in DC. Prodr.* 10, *p.* 329. Mountains east of San Diego, California; June; *Parry.* Near the town of the same name; May; *Thurber.* Santa Barbara; *Major O. Rich.* This species differs from all the rest of the genus in its somewhat climbing habit. It runs over tall bushes like a Lonicera, and has bright scarlet flowers, which are resupinate.

PENTSTEMON TERNATUS, (*Torr. MSS.*): glaber; caulibus e basi fruticosa erectis; foliis ternatim verticillatis lanceolatis argute denticulatis utrinque acutis; panicula laxa pauciflora; corollæ tubo elongato vix ampliato labio recto; filamento sterili barbato.—Mountains east of San Diego; June; *Parry.* Branches straight and slender. Leaves about one inch long. Flowers in terminal racemose panicles. Pedicels verticillate. Segments of the calyx ovate-lanceolate, acuminate. Corolla nearly an inch long, pale scarlet according to *Dr. Parry.* This species belongs to the section Elmigera of Bentham.

PENTSTEMON CENTRANTHIFOLIUS, *Benth. Scroph. Ind. p. 7, adnot. & in DC. Prodr.* 10, *p.* 323. Mountains east of San Diego, California; June; *Parry.* Also near Monterey; *Dr. Andrews and Mr. Shelton.* A fine deep scarlet-flowered species, with the leaves very variable in breadth.

PENTSTEMON BREVIFLORUS, *Lindl. Bot. Reg. t.* 1946; *Benth. in DC. Prodr.* 10, *p.* 329. California, (near Monterey;) *Rev. A. Fitch.* A rare and remarkable species; also found by Dr. Bigelow on the Stanislaus river. Corolla yellow, except the lobes of the lower lip, which are pale purple.

PENTSTEMON HETEROPHYLLUS, *Lindl. Bot. Reg., t.* 1899; *Benth. in DC. Prodr.* 10, *p.* 300; *Gray in Bot. Whipp. Rep.* Mountains east of San Diego, California; June; *Parry.* Near Monterey; *Dr Andrews.* Our specimens appear to be suffrutescent. The flowers are pale purple.

PENTSTEMON ANTIRRHINOIDES, *Benth. in DC. Prodr.* 10, *p.* 594. Dry valleys among the mountains east of San Diego, California; June; *Parry.* San Pasqual; *Thurber;* May. A rare shrubby species, 3 or 4 feet high.

LEUCOPHYLLUM TEXANUM, *Benth. in DC. Prodr.* 10, *p.* 344. Common in southern and western Texas, occurring in all the collections. The stigma is bilamellate, as described by *Kunze*, but the two lamellæ commonly cohere. This must be a beautiful shrub when loaded, as it often is, with its rich violet-purple blossoms, contrasting with its silvery white foliage. In the finest specimens the limb of the corolla is fully an inch in diameter, and delicately soft-bearded within, and the wide tube two-thirds of an inch long to the base of the lobes. Sometimes the fifth stamen is present and imperfectly antheriferous.

LEUCOPHYLLUM MINUS (sp. nov.): humile; foliis obovato-spathulatis retusis pube minuta argenteis; calycis laciniis linearibus; corollæ lobis tubo dimidio brevioribus.—Hills on and near the Pecos; *Wright*, (442, 1481.) Between Van Horn's Wells and Muerta; *Bigelow, Parry.* A low, spreading shrub, only two feet high; the tomentum much finer and closer than in the foregoing, and the purple flowers not half the size. Leaves from a quarter to half an inch long, including the petiole or tapering base. I am not sure that this is specifically distinct from L. ambiguum, having no specimen of that species. The corolla is, however, as deeply cleft as in L. Texanum.

MIMULUS LUTEUS, *L.; Benth. in DC. Prodr.* 10, *p.* 370; var. gracilis; floribus minoribus. (Near M. Scouleri; *Hook;* which can be only a form of M. luteus.) Copper Mines, New Mexico, and

near Cruces; *Bigelow.* Gila valley; *Schott.* Napa county, California; *Thurber.* San Luis Obispo; *Parry.* The capsule of this species accords with the generic character, as given by Bentham, &c., except that the membranaceous valves scarcely, if at all, separate from the undivided placenta, but remain coherent by means of the thin and short partitions.

MIMULUS GLABRATUS, *H. B. K. Nov. Gen. & Spec.* 2, *p.* 370; *Benth. l. c.* Copper Mines and Mimbres, New Mexico; *Bigelow; Wright.,* (1842,) *&c.* Ojo Francisco and Tucson, Sonora; *Parry & Capt. S. K. Smith.* Texas; *Wright & Lindheimer.* This appears to vary as much in size and aspect, and to have nearly as large a geographical range as M. luteus; and M. Jamesii is pretty plainly no more than a smaller flowered and almost entire-leaved northern form of it.

MIMULUS BREVIPES, *Benth. Scroph. Ind.* 2, *adnot., & in DC. Prodr.* 10, *p.* 369. Near San Diego, California, May; *Thurber, Parry, etc.* Chiefly narrow-leaved forms, the same as Coulter's No. 640. Bentham indicates it as perennial, but our Douglasian specimens show an annual root; so do those of Thurber. The capsule of this species is ovoid-lanceolate, rather firm and chartaceous in texture, loculicidal and splitting through the axis, separating the two placentæ, which remain adnate to the valves, just as in Diplacus. Through M. rubellus, etc., there is a regular gradation as to the dehiscence between this and the Mimuli with a thin and membranaceous capsule, and a fleshy placenta, which shows no disposition to split.

MIMULUS CARDINALIS, *Dougl.; Benth. l. c.* Near San Diego, and in the mountains westward, California; *Parry.* The valves of the capsule with the partitions in this species tardily separate from the axis, from which the two placentæ are pretty widely separated, being projected far into the cells.

MIMULUS RUBELLUS, (sp. nov.): tenellus, erectus, e radice annua ramosus, viscido-puberulus; foliis anguste oblongis lanceolatisve trinervibus fere integerrimis basi angustatis sessilibus; pedunculis folium plerisque superantibus; calycis oblongi dentibus brevibus aequalibus, ore aequali; corollæ purpureæ tubo haud exserto.—Wet ravines of the Organ mountains and Copper Mines, April; *Bigelow, Wright,* (1483,) and Hueco mountains; *Thurber,* (135.) Plant 2 to 6 inches high. Leaves 3 to 8 lines long, the uppermost acutish. Calyx perfectly equal at the summit, even in fruit, 3 lines long, narrow. Tube of the corolla yellowish, the limb 1½ line long, pink or purple. The valves of the capsule are pretty thin and delicate; but the placenta splits at the summit in dehiscence, or is bipartible, one half remaining adnate to each valve.

MIMULUS (DIPLACUS, *Nutt.*) GLUTINOSUS, *Wendl. Obs., p.* 51. San Francisco, Monterey, and San Diego, California. In various forms, and both with red and yellow flowers. Several annual Mimuli being dehiscent through the placenta in the same way as the present plant, there appears to be no ground for viewing Diplacus as anything more than a marked section of Mimulus, distinguished by its shrubby habit, glutinous foliage, and narrow pods of a firm texture.

EUNANUS FREMONTI, *Benth. in DC. Prodr.* 10, *p.* 374? Dry gravelly places near Monterey, May; *Parry.* Only a single and miserable specimen was gathered. It seems likely to be a state of E. Frémonti, or possibly of Douglasii, with a remarkably abbreviated corolla.

HERPESTIS CHAMÆDRIOIDES, *H. B. K. Nov. Gen. & Spec.* 2, *p.* 369. Santa Cruz, and Sierra Verde, Sonora; *Wright,* (1484,) *Schott.* Also a variety with simpler and less spreading stems, and obscurely toothed leaves (H. nigrescens, *Engelm. & Gray, Pl. Lindh. No.* 140.) between the Pecos and the Limpio; *Wright,* (443,) and Rock Creek; *Bigelow.*

HERPESTIS ROTUNDIFOLIA, *Pursh, Fl.* 2, *p.* 418. Along the Rio Grande below El Paso; *Wright.* (444.)

HERPESTIS MONNIERA, *H. B. K. l. c.* H. cuneifolia, *Pursh.* Monniera cuneifolia, *Michx. Fl.* 2, *p.* 22. Marshy shore of the Rio Grande, between Eagle Pass and Laredo, April; *Schott.* Monterey, Neuvo Leon; *Dr. Edwards.* Chihuahua; *Dr. Gregg.*

CONOBEA (SCHISTOPHRAGMA) INTERMEDIA, (sp. nov.): viscoso-pubescens; foliis subpinnatipartitis; floribus brevissime pedunculatis; antheræ loculis subcontiguis; capsula ovato-lanceolata calyce subinæquali dimidio longioribus.—Dry hills around the Copper Mines, New Mexico; very common; *Wright.* (1485). Annual, erect spreading, 2–6 inches high, with the aspect of C. (Leucospora) multifida; only more pubescent; the flowers very short-peduncled; the corolla twice as large, purple, or the lower lip pale. Capsule 3 or 4 lines long, pointed. This connects Bentham's Conobea multifida and his Schistophragma pusilla in such a way as to render it necessary to comprehend under one and the same genus these three species of closely similar aspect. The pod is just intermediate between the ovate shape of the first and the linear form which distinguishes the last; but it has the spirally striate seeds of Schistophragma. Its unequal calyx (the upper sepal being somewhat larger, or at least longer than the others,) would appear to exclude it from Schistophragma no less than from Conobea; but I observe the same thing, only rather less marked, in an authentic specimen of Bentham's S. pusilla var. major, from Santa Martha. The stigma is essentially the same in all three. The present species has one peculiarity: while in its unequal calyx it seems to approach Herpestis, in its anthers, (the cells of which are not side by side, but one inserted a little above the other) it approaches Stemodia and its allies.

CONOBEA MULTIFIDA, *Benth. in DC. Prodr.* 10, *p.* 491. Capraria multifida, *Michx. Fl.* 2, *p.* 22, *t.* 35. Common on the sandy shore of the Rio Grande near Eagle Pass, April—May; *Schott.* Rio Coleto, Texas; *Thurber.*

GRATIOLA PUSILLA, *Torr. in DC. Prodr.* 10, *p.* 402. On the Colorado, Texas; *Wright.*

VERONICA ANAGALLIS, *L.* New Mexico, on the Mimbres; *Wright,* (1487,) *Thurber;* and near the Copper Mines; *Bigelow.*

VERONICA PEREGRINA, *L.* On the Rio Grande, near El Paso, and Lake Santa Maria, Chihuahua; *Wright,* (1488.) Plains near Laguna de Lache, Solado, Mexico; *Bigelow.* Tubac; *Parry.* San Bernardino, Chihuahua; *Thurber,* (376.)

BUCHNERA ELONGATA, *Swartz. Fl. Ind. Occ.* 2, *p.* 1061. Painted Caves and Medina creek, Texas; *Bigelow, Schott.*

SEYMERIA BIPINNATISECTA, *Seem. Bot. Herald, p.* 323, *t.* 59, var. TEXANA: pilis glandulosis et viscidis pubescens seu villosa; ramis subvalidis; foliis bipinatifidis vel superioribus pinnatifidis, segmentis lato-linearibus obtusis inciso-dentatis; pedicellis sæpissime brevibus; antheris obtusissimis; capsulis glandulosis acutatis vel obtusis.—Upper Guadalupe river, etc.; *Lindheimer.* Lower Rio Grande; *Wright.* Head of the Pedro river, Sonora? *Bigelow.* A stouter, more pubescent and glandular plant than S. pectinata, and with the leaves much more cut, sometimes even tripinnatifid. The shape of the capsule varies so in the numerous specimens under examination that I fear it cannot be greatly relied upon in this genus. The above character was drawn up, under a different name, before Seemann's plant was published. I have not seen Mexican specimens. Our plant has less dissected foliage and (except in one or two instances) much shorter pedicels than are delineated in Seemann's figure, and no such incised or pinnatifid calyx-lobes, (which, by the way, are not mentioned in the character,) still the two are likely to fall under the same species.

SEYMERIA SCABRA (sp. nov.): hispidulo-scabra, gracilis; foliis linearibus parvis pinnatipartitis paucilobatis superioribus 3–5-fidis integrisve; corolla fere glabra; antheris sagittatis, loculis acutis; capsulis glabellis ovato-acuminatis.—Mountain sides beyond the pass of the Limpio; *Wright*, (448.) Lower leaves wanting; the largest seen little over half an inch in length; the segments narrowly linear 1–2-toothed or entire. Flowers about as large as those of S. pectinata. Calyx-lobes narrowly linear. Capsule fully 4 lines long. Well marked by its anther-cells tapering gradually to an acute point.

GERARDIA WRIGHTII (sp. nov.): caulibus e radice perenni simplicibus virgatis cum foliis lineari-filiformibus mucronato-acutatis scaberrimis; pedunculis flore æquilongis; calyce truncato breviter 5-dentato; corolla flava late campanulata e tubo brevissimo extus pubescente intus glaberrima; filamentis brevibus apice tantum villosis; antheris conformibus nudis obtusissimis basi sagittatis, loculis aristato-subulatis; stigmate clavato.—Hill sides between Babacomori and Santa Cruz, Sonora; *Wright*, (1489,) *Bigelow*. With the habit, calyx, and corolla of a true Gerardia, sect. campanifloræ, this plant has yellow flowers, (according to Mr. Wright's notes taken on the spot,) naked anthers, short-awned at the base, and the filaments glabrous except near the summit. The stamens are pretty strongly didynamous, and the four anthers similar.

GERARDIA HETEROPHYLLA, Nutt.? var. pedunculis calyce dimidio brevioribus; foliis plerisque ultra-pollicaribus. Leone Spring, Texas; *Bigelow*.

GERARDIA PURPUREA, *Linn.* San Pedro river, etc., Texas; *Parry, Schott.*

CASTILLEJA INDIVISA, *Engelm. Pl. Lindh.* 1, *p.* 47; *Benth. in DC. Prodr.* 10, *p.* 530. San Pedro river; *Wright*, (453,) etc.; *Bigelow*. Castle-Mountain Pass, Texas, October; *Thurber*.

CASTILLEJA PURPUREA, *Don.; Benth. in DC. Prodr.* 10, *p.* 531. Euchroma purpurea, *Nutt.* Texas; *Wright*, &c. Not seen on the Rio Grande, but common further north and east. Well distinguished by the lower lip of the corolla, which is 2½ lines long, but not always half as long as the galea. The calyx is commonly split as deeply behind as before. "Bracts and calyx varying from sulphur yellow to flesh-color, brick-red, and cherry-red, even in the same locality, so that the specific name is not a good one." (*Lindheimer.*) The root is perennial.

CASTILLEJA LANATA (sp. nov.): perennis, tomento floccoso simplici denso undique incana; foliis linearibus integerrimis, floralibus nunc trifidis apice coloratis; spica demum interrupta; calycis æqualiter bifidi lobis obovato-oblongis integerrimis retusisve corollæ labium inferius multum superantibus.—Along and near the Rio Grande, from Eagle Pass, etc., to El Paso; *Wright*, (452, 1495), *Bigelow*, *Parry*, etc. On the Limpio; *Wright*, (451.) Near Buena Vista; *Gregg*. A most remarkable white-woolly species, with larger leaves and flowers than C. foliolosa. The latter species is sometimes almost as white, but its tomentum is formed of repeatedly branched hairs, whereas the wool of C. lanata consists of long and simple arachnoid hairs.

CASTILLEJA TOMENTOSA (sp. nov.): perennis, pilis simplicibus laxis cano-lanata; foliis linearibus margine revolutis integerrimis, floralibus trifidis superne coloratis; spica demum interrupta; calycis subæqualiter bifidi lobis semibifidis lanceolatis acutis corollam æquantibus.—Mabibi, Sonora, June, 1851; *Thurber*. Considerably like the last and C. foliolosa, but the wool less dense and floccose than in C. lanata, and the calyx different, and apparently fully as long as the galea. Floral leaves and calyx-lobes red or purple.

CASTILLEJA ANGUSTIFOLIA. Euchroma angustifolia & E. Bradburii, *Nutt. in Jour. Acad. Philad.* 7, *p.* 46? On Live Oak creek, the Limpio, etc., *Wright*, (1491, 1492, with yellow bracts and calyx;) also in his first collection, but undistributed. Mr. H. Engelmann collected it at Bridger's Pass. This most likely belongs to Nuttall's species, but the lower leaves are

mostly entire. The calyx is not equally 4-cleft, but is equally 2-cleft and the divisions 2-cleft, nearly as in C. purpurea, from which it differs by the short lower lip of the corolla.

CASTILLEJA SESSILIFLORA, *Pursh, Fl. 2, p.* 728. Low places near Rock creek and Mule Springs; *Bigelow.* Eagle Pass; *Parry.* Santa Maria, Chihuahua; *Schott.* Mule Springs, New Mexico, May; *Thurber.*

CASTILLEJA HISPIDA, *Benth. in Hook. Fl. Bor.-Am., & in DC. Prodr.* 10, *p.* 532. Dry hills, San Diego, California; *Parry.*

CASTILLEJA INTEGRA (sp. nov.): perennis; caule stricto tomentoso; foliis linearibus integerrimis subtus tomentulosis, floralibus oblongis obovatisque integerrimis coloratis (puniceis); spica conferta; calyce æqualiter vel postice profundius bifido, lobis bifidis lanceolatis obtusiusculis labium inferius galea multoties brevius adaequantibus.—Organ mountains, east of El Paso; *Wright,* (undistributed,) *Bigelow.* Guadaloupe cañon, Sonora; *Capt. E. K. Smith.* Also gathered in the Rocky Mountains further north by Mr. Kreuzfeldt, in Gunnison's expedition. Stem one or two feet high, mostly simple, rigid; leaves 1½ to 3 inches long, 2 to 3 lines wide, entire; most of the floral ones almost wholly petaloid, ample, shorter than the fully developed flowers. Calyx 8 or 12 lines long, red or reddish; "corolla reddish green;" galea 6 to 8 lines long; the lower lip very short Apparently a well marked new species of the section Callichroma. It is No. 584 of Fendler's New Mexican collection; and Dr. Bigelow gathered specimens in Whipple's expedition on the Llano Estacado.

CASTILLEJA AFFINIS, *Hook. & Arn. Bot. Beech. p.* 144; *Benth. l. c., p.* 532; var. MINOR; corolla calyce paullo longiore. Bed of exsiccated streams, near the Copper Mines, New Mexico; *Bigelow, Wright,* (1494.) Santa Maria, Chihuahua; *Bigelow, Wright,* (1493.) Presidio del Norte and Sonora; *Schott.* Los Animos; *Thurber.* Tubac, Sonora; *Parry.* And Santa Cruz Mountains in the same State; *Captain E. K. Smith.* A slender, often branching plant, with an annual or biennial root. Flowers, especially the corolla, very much smaller than in the typical Californian plant (such as Hartweg's No. 1896;) but Hartweg's No. 1897 connects the two. The lobes of the calyx vary from nearly entire to deeply 2-cleft; the tube is often split down deeper on the posterior than the anterior side.

CASTILLEJA LAXA (sp. nov.): herbacea, cinereo-pubescens; caulibus e radice perenni subdiffusis ramosis gracilibus; foliis tenuibus scabridis lineari-lanceolatis integerrimis basi haud dilatatis, floralibus calyce brevioribus, superioribus rubro-coloratis; floribus paucis confertis breviter pedicellatis; calyce rubello antice profundius postice leviter fisso, dentibus brevibus obtusis; corollæ galea magna, lobis labii inferioris brevissimis obtusis.—Mountain sides near Santa Cruz, Sonora; *Wright,* (1490.) This appears to be a well-marked species of the section Hemichroma, with the bracts and calyx more colored than is usual in that section. The thin leaves do not turn blackish in drying; they are mostly about 2 inches long and 3 lines wide; the floral shorter and blunter, the lower mostly green, the upper colored red. Calyx very thin, slightly pubescent, an inch long, exceeding the lower lip of the corolla by 3 or 4 lines, but half or two-thirds of an inch shorter than the ample galea, nearly straight, deeply cleft anteriorly, but on the posterior side only to the depth of 2 or 3 lines; the teeth broad and short. Galea somewhat pubescent on the back, yellowish, the edges tinged with red.

CASTILLEJA LINARIÆFOLIA, *Benth. in DC. Prodr.*, 10, *p.* 532. Arroyos in Sonora; *Thurber.* "Plant 4 to 6 feet high." Though the calyx is rather shorter and the falcate galea longer, this appears to be only C. linariaefolia. To it probably belongs C. fulgens, *Nutt. ined.*, and C. can-

dens, *Durand, Pl. Herrm.* Dr. Bigelow gathered it at Albuquerque, New Mexico, when in Whipple's expedition; and Fendler's No. 583 is a narrow-leaved form of the same species.

ORTHOCARPUS ERIANTHUS, *Benth. Scroph. Ind., p.* 12, *& in DC. Prodr.* 10, *p.* 535. Grassy places near San Diego, California, March; *Dr. Parry.*

ORTHOCARPUS DENSIFLORUS, *Benth. l. c.* Dry hill sides, Monterey, California, April. Stem nearly simple, but the specimens are early ones, and later in the season no doubt the plant becomes much branched. Lower leaves simple, tapering to a very long narrow point. Appendages of the lower lip rather obtuse.

ORTHOCARPUS LACERUS, *Benth. Pl. Hartw., p.* 329. San Luis Obispo, California; *Dr. Parry.*

ORTHOCARPUS PURPURASCENS, *Benth. DC. Prodr.* 10, *p.* 536. Moist grassy places, near Monterey, California, April; *Parry.*

CORDYLANTHU LAXIFLORUS (sp. nov.): paniculato-ramosus, hirsutissimus, sublandulosus; foliis linearibus brevibus integerrimis rarius trifidis; floribus solitariis vel in ramulos breves adproximatis unibracteatis; calycis lobo postico apice bidentato; corollæ labio inferiori saccato subintegerrimo; antherarum loculo altero abortivo seu in stam. brevioribus plane nullo.—Rocky hills, Sonora, Mexico; *Thurber.* Also Great Salt Lake; *Col. Frémont*, 1843. Plant branched from the base, 1 or 2 feet high, turning dark colored in drying, very hirsute throughout with rather viscid and and sometimes rather glandular spreading hairs; branchlets very numerous, short, very leafy throughout, bearing from one to four or five flowers. Leaves 6 to 9 lines long, about a line wide. Calyx half an inch long, almost equalling the "bright yellow" corolla. Galea nearly straight, broad. Anthers one-celled and with a minute pendulous vestige of the second cell, at least in the longer stamens. A true congener of the Californian species, remarkable for its scattered flowers, and for the abortion of the smaller anther cells.

CORDYLANTHUS WRIGHTII (sp. nov.): paniculato-ramosus, glabellus, minute glandulosus; foliis 3–5-partitis filiformibus; bracteis conformibus haud ciliatis; floribus subcapitatis; calycis lobo postico 2–3-dentato; antherarum loculo altero pendulo etiam in staminibus brevioribus manifesto. Prairies, from 6 to 30 miles east of El Paso, Western Texas; *Wright*, (450.) Sand hills, Chihuahua; *Thurber.* This, far the most eastern of the genus, was first met with by Mr. Wright, who found it only in the autumn of 1849, in his first expedition, which was attended by many hardships, but which was very rich in its botanical results. This species is nearly related to C. filifolius; but it is not so rigid, has finer foliage (without hispid hairs,) less capitate and larger flowers, the more incurved corolla an inch and a quarter long, and the upper lip of the calyx is more or less 2–3-toothed or cleft at the apex. Seeds elongated-oblong, deeply farove-reticulated.

CORDYLANTHUS FILIFOLIUS, *Nutt.; Benth. in DC. Prodr.* 10, *p.* 597, California, (station not recorded, but probably Monterey;) *Parry, Shelton.* The middle lobe of the involucral bracts is somewhat dilated at the extremity and truncate-emarginate.

PEDICULARIS CENTRANTHERA (sp. nov.): acaulis, glabra; foliis pinnatifidis scapum bis superantibus, segmentis ovatis duplicato-dentatis margine denticulisque subcartilagineis discoloribus (albis;) spica oblonga densiflora; calycis cylindracei dentibus 5 aequalibus lanceolatis albido-marginatis; corollæ galea cucullata erostri edentula labio inferiore patente paullo longiore; filamentis glabris; antheris basi eximie bicalcaratis.—New Mexico, and on Ben More, April, *Bigelow;* the specimens from the latter locality nearly past flowering. This is unlike any other Pedicularis that I know of, and is distinguished by its awned or spurred anthers from all known species except P. grandiflora, *Fisch.*, with which it has little else in common. The

awns are so long that their tips often project beyond the hooded summit of the galea. Leaves all radical, 6 inches long, broadly linear in outline, fringed with fine and white teeth. Peduncle an inch long, spike (partly in fruit) 3 inches long. Tube of the calyx half an inch long; the lobes 3 lines long, their whitish margins somewhat crisped and erose. Corolla twice the length of the calyx, apparently pale purple; the tube slender; the helmet-shaped galea obtuse and not appendaged. Stamens inserted low down on the tube; anthers 2½ lines long, including the tapering spurs.

PEDICULARIS DENSIFLORA, *Benth. in Hook. Fl. Bor.-Am.* 2, *p.* 110. Dry gravelly plains; abundant near Monterey, California, May; *Parry;* also in Napa county, in the same State, March; *Thurber.*

LOGANIACEÆ.

MITREOLA PETIOLATA, *Torr. & Gray, Fl.* 2, *p.* 45. Wet places on Devil's river, and along the middle and lower Rio Grande; also in Santa Rosa valley, Chihuahua, September to October. Leaves larger and broader than usual.

POLYPREMUM PROCUMBENS, *Linn. in Act. Ups.* (1741,) *t.* 78; *Torr. & Gray, l. c.; Cham. & Schlecht. in Linnæa,* 5, *p.* 173. Common on the Lower Rio Grande, April; *Schott.*

BUDDLEIA HUMBOLDTIANA, *Roem. & Schult.* Rinconada Pass, December; *Thurber.*

BUDDLEIA MARRUBIIFOLIA, *Benth. in DC. Prodr.* 10, *p.* 441. On the Rio Grande from the mouth of the Pecos to Presidio del Norte; *Parry, Bigelow.* A neat shrub, 3–5 feet high, with heads of golden yellow odorous flowers, which turn to orange red. It is No. 1407 and 1780 of Berlandier's Coll.; 311 of Wislizenius, and 444 Gregg.

BUDDLEIA SCORDIOIDES, *H. B. K. Nov. Gen. & Spec.* 2, *p.* 345, *t.* 183. Valley of the Pecos, and in Sonora; *Wright,* (No. 447, 1486.) Mountains of Muerte, July; *Bigelow.* On the Rio Grande, below San Carlos, October; *Parry.* Coralitas, Chihuahua, August; *Thurber.*

BUDDLEIA RACEMOSA (n. sp.): fruticosa, 1–3-pedalis; foliis oblongis subovatisve obtusis inaequaliter crenato-dentatis basi subhastatis truncatisve raro abrupte cuneatis petiolatis glabratis subtus ramisque junioribus pulverulenteo-canescentibus atormiferis; capitulis globosis plurifloris breviter seu longiuscule pedunculatis in racemum virgatum elongatum fere nudum dispositis; tubo corollæ calyce tomentoso brevioribus. (Upper Guadalupe, etc., Texas; *Riddell, Lindheimer, Wright, Ervendberg.*) August, November. Var. *incana:* foliis pube mollissima supra tenuiter tomentuloso subtus crebre tomentoso incanis. San Pedro river; *Wright,* (446.)

EMORYA, Nov. Gen.

Omnino Buddleia, nisi filamenta stylusque exserta capillaria. Frutex 3–6-pedalis, ramosus; foliis oblongis subhastatis sinuato dentatis discoloribus; inflorescentia laxa racemoso-thyrsoidea; floribus sesqui-pollicaribus viridi-ochroleucis.

EMORYA SUAVEOLENS, (TABLE XXXVI.) Cañons of the Rio Grande, below the Presidio del Norte, October; *Parry.* Leaves opposite, 1—2 inches long, and from half an inch to an inch and a half broad, sinuately or repandly toothed, very obtuse or truncate at the base, glabrate above, whitish tomentose underneath; petioles scarcely half the length of the lamina, connected at the base by an elevated ring. Flowers in terminal cymulose panicles, sweet-scented; pedicels bibracteolate, the bracteoles subulate. Calyx tubular, 4–8-costate, 4-cleft nearly to the middle; segments nearly equal, linear-lanceolate erect. Corolla tubular, elongated, three times as long as the calyx, equally 4-cleft, the segments short and obtuse. Stamens 4, subaequal,

exserted; anthers 2-celled, bifid at the base, mucronulate at the summit; filaments slender, very smooth, inserted into the middle of the tube of the corolla. Ovary oblong-conical, the base surrounded by a glandular ring. Style conspicuously exserted, filiform, smooth, except at the base, which is a little pubescent, somewhat clavate at the summit; stigma small, capitate. Capsule oblong, apiculate, 2-celled, septicidal; valves 2-cleft at the summit; placentae thick, adnate to the axis. Seeds numerous, imbricated, the testa loose, cristate at both ends twice the length of the nucleus. Embryo straight. We have seen one or two pentamerous flowers. This genus is dedicated to Major William H. Emory, United States Commissioner to the Mexican Boundary Survey, who has taken the liveliest interest in the botany of the region explored under his command, and has afforded every facility to the gentlemen who had that department of science in charge. Mr. Miers, to whom we sent specimens of this plant, thought it might be referred to the tribe Buddleiæ. Indeed it is nearly related to Buddleia itself.

ACANTHACEÆ.

ELYTRARIA TRIDENTATA, *Vahl. var.* CAULESCENS, *Nees, in DC. Prodr.* 11, *p.* 64. Guadaloupe cañon, etc. Sonora; *Capt. E. K. Smith, Schott, Thurber.* Lower California; *Mr. Rich.* (No. 1647, *Wright.* No. 1207, *Coulter;* Mexico.)

CALOPHANES OBLONGIFOLIUS, *D. Don. in Sweet Fl. Gard.* 2, *t.* 181; *Nees, l. c. p.* 107. Valley of the Santa Cruz river, etc., Sonora; *Capt. E. K. Smith, Thurber.* Plains between Van Horn's Wells and Muerte, and down the valley of the Rio Grande to the Gulf of Mexico. (No. 1462, *Wright.*)

C. OBLONGIFOLIUS, var. TEXENSIS, *Nees, l. c., p.* 108. C. linearis, *Engelm. & Gray, Pl. Lindh.* 2, *p.* 50, (*adnot.*) Common along the middle Rio Grande on both sides of the river, and in Sonora; flowering from April to September. (Nos. 1463 and 1464, *Wright.*)

CRYPHIANTHUS BARBADENSIS, *Nees, Del. Sem. Hort. Vratisl.* 1841, *& in DC. Prodr.* 11, *p.* 197. Dipteracanthus nudiflorus, *Engelm. & Gray, l. c., p.* 21. Moist places in central and western Texas, particularly along the lower Rio Grande; *Schott, Bigelow.* (Nos. 1454 and 1455, *Wright.*) Ruellia alba, *Nees* is, perhaps, not distinct.

DIPTERACANTHUS? SUFFRUTICOSUS (n. sp.): caule glabro inferne fruticoso erecto; foliis obovato-oblongis glabriusculis subcoriaceis basi in petiolem attenuatis, margine retrorsum ciliatis; pedunculis axillaribus 1-floris; bracteolis oblongo-lanceolatis; calycis laciniis lanceolato-linearibus tubo corollæ elongato gracili subtriplo brevioribus. Presidio del Norte; July—August; *Parry.* Sides of rocky hills, valley of the Pecos. No. 1461, *Wright.* Plant apparently about a foot high. Leaves 1–1½ inch long, acute or obtuse, smooth or slightly pubescent. Peduncles 2–4 lines long, the bracts a little longer than the calyx. Segments of the calyx sparsely ciliate. Corolla white; the tube 1½ inch long, very slender, somewhat dilated at the summit; lobes of the limb roundish-obovate. Stigma simple, (the inferior lobe abortive.) Capsules 4-seeded; seeds hispid. This is the only suffruticose species of this genus known within the limits of our Flora.

STENANDRIUM BARBATUM, *Torr. & Gray, Bot. Pope's Rep. p.* 13, *t.* 4. Mountains and hill sides along the Rio Grande from El Paso to the mouth of the Pecos; March—April. (No. 1453, *Wright.*) Stem branching from a thick wood base. Flowers pale purple.

SCHAUERIA PARVIFOLIA (n. sp.): suffruticosa e basi ramosorissima glanduloso-pubescens; foliis oblongis ovatisve acutis; spicis terminalibus subpaniculatis interruptis; floribus oppositis sessili-

bus bracteis bracteolisque subulatis; calycis laciniis lanceolato-subulatis; corolla (purpureo) subbilaliata, labio superiore integro vel vix emarginato, labiis oblongis æqualibus, labio inferiore profunde trifido; antherarum loculis parallelis contiguis muticis. Mountains and rocky places on the Cibolo of the Rio Grande; August; *Bigelow*. Monterey, Nuevo Leon; *Dr. Edwards, Dr. Gregg*. Howard Springs; *Schott*. (No. 1460, *Wright*. No. 1459 is an early state of the same, in which the flowering branches or spikes are not developed.) At Oak creek, western Texas, Mr. Schott collected specimens with larger and almost orbicular obscurely repand leaves. They probably grew in a shady place. Plant 6–12 inches long, sometimes diffuse. Leaves ½ to 1 inch in length, abruptly narrowed to a petiole which is 3 to 6 lines long. Flowers in loose compound spikes or panicles terminating the branches. Segments of the calyx subulate. Corolla 4–5 lines long; the segments nearly equal and about as long as the tube. Capsule 5 lines long, the lower half abruptly contracted and stipe-like; the upper part orbicular-ovate, acuminate, smooth, 4-seeded. Seeds discoid, muriculate, black.

SCHAUERIA LINEARIFOLIA (n. sp.:) suffruticosa e basi ramosissima glaberrima; foliis angusto-linearibus; spicis terminalibus gracilibus paniculatis, floribus distantibus, bracteis bracteolisque subulatis; calycis laciniis lanceolato-subulatis, corolla (purpurea) subbilabiata laciniis oblongis subæqualibus; antherarum loculis parallelis contiguis muticis. Rocks at the mouth of the Great cañon of the Rio Grande, and on the Burro mountains; June—October; *Bigelow, Parry*. (No. 436, *Wright*.) About a foot high. Leaves 8–10 lines long; the lowest ones a little broader and somewhat spatulate; upper ones half a line wide. Flowers solitary in the upper axils, the leaves being gradually reduced to subulate bracts, so that the inflorescence becomes spicate. Calyx, corolla, and fruit, as in the preceding species.

DREJERA* WRIGHTII (n. sp.): ramis bifariam pubescentibus; foliis oblongo-lanceolatis acuminatis glabris, spicis unilateralibus nudis; calyce glanduloso-pubescente profunde 5-fido, laciniis oblongo-lanceolatis; corollæ tubo angusto calyce multoties longiore, labio inferiore tripartito, laciniis lanceolato-linearibus. Between the Guadaloupe river, Texas, and the Rio Grande; also near Monterey, Nuevo Leon; June—October. Nos. 435 and 1457, *Wright*. Plant apparently 3 to 4 feet high; dull grayish green; the branches terete, marked with two broad lines of soft pubescence. Leaves 1½–2 inches long, and 6–8 lines wide; green on both sides; the petiole 3–5 lines long. Spikes terminating the paniculate branches. Bracts about as long as the very short pedicels. Corolla an inch and a half long; purplish red; the tube slender, inflated at the base, the enlarged portion about the length of the calyx; segments of the upper lip a line and a half wide; upper lip emarginate. Anther-cells linear, contiguous, parallel. Capsule smooth, 6–7 lines long, the upper half rhombic-ovate and semeniferous; the lower attenuated to a narrow stipe and empty. Seeds commonly 2, rarely 3 or 4, lenticular, smooth.

DREJERA PUBERULA, (n. sp.): ramis bifariam pubescentibus; foliis oblongo-lanceolatis vel lineari-lanceolatis puberulis brevipetiolatis; spicis brevibus axillaribus terminalibusque foliosis; calyce glanduloso-pubescente profunde 5-fido, laciniis lineari-subulatis; corollæ tubo angusto calyce multoties longiore, labio inferiore tripartito, laciniis lanceolato-linearibus. Gravelly hills and ravines along the Cibolo of the Rio Grande; May—June; *Bigelow*. No. 1456,

* We have adopted Œrsted's view of the limits of Drejera, (in Vidensk. Medd. Naturhist. For Kjobenh. 1854, p. 154,) merely extending the character as to the calyx, which is 5-cleft or 5-parted. It includes Drejera, *Nees*, and Jacobinia § 2 of the same author in *DC. Prodr.* The latter genus was founded on *J. lepida*, and is the only species referred by Nees, to his first section. It differs so much from the species of the second group, which we would transfer to Drejera, that it may remain by itself.

Wright. Valley of the Rio Conchos, below Santa Rosa, Chihuahua; *Gregg.* A narrow leaved form; collected form is No. 1237, *Berlandier.* Collected at San Juan del Rio, between the city of Mexico and Queretaro. A shrub 4 to 8 feet high. Leaves 1–2½ inches long, sparsely pubescent on both sides; petioles 1–3 lines long. Flowers and fruit nearly as in the preceding species.

DREJERA THURBERI (n. sp.): foliis (parvis) oblongis lanceolatisve pubescentibus; floribus fasciculatis quasi verticillatis foliis longioribus; calyce glanduloso-pubescente profunde 5-partitis, laciniis subulato-setaceis glanduloso-pubescentibus hirsutisve corollæ tubo vix triplo-brevioribus. Along water-courses, Las Animas, Sonora; June; *Thurber.* Sierra del Pajarito; *Schott.* Cañon of Guadaloupe; April; *Capt. E. K. Smith.* An ornamental shrub, 3–4 feet high, with a gray or whitish bark that separates in shreds. Leaves about three-quarters of an inch long, obtuse and acute. Flowers mostly resupinate. Corolla dull red, an inch or more in length; the tube funnel-form; lower lip 3-parted, the divisions linear-lanceolate. Capsules mostly 2-seeded, as long as the fructiferous calyx.

DREJERA JUNCEA (n. sp.): aphylla (an semper?); ramis virgatis minute pubescentibus; spicis remotifloris paniculatis; calyce profunde 5-fido glabrescente, laciniis subulatis corollæ tubo angusto multo brevioribus. In a sandy ravine, La Peña, Cohahuila; November; *Thurber.* Plant 3–4 feet high, entirely leafless where found by Mr. Thurber, but it may bear leaves early in the season. Flowers sessile in unilateral spikes, without either bracts or bracteoles. Calyx at first somewhat pubescent, but at length nearly or quite smooth. "Corolla scarlet," an inch or more in length; the tube slender; lower lip deeply 3-parted, the divisions linear and narrow. Capsule ovate above the middle, tapering to a narrow base below; 2-seeded. Besides the four species of Drejera here described, we have, from the collections of Dr. Gregg, another, which does not appear to have been noticed hitherto. It was found on the battle field of Paso del Gallinero. The specimens are not sufficient for a full description, but the following character will serve for its identification:

DREJERA GREGGII (n. sp.): ramis bifariam pubescentibus; foliis ovatis scabriuscule pubescentibus subulato-venosis; floribus fasciculatis foliis longioribus; calyce incano pubescente, lobis lanceolatis tubo subæqualibus. A stout shrub. Leaves 1–1½ inch long, somewhat roughly pubescent on both surfaces; petioles 1–2 lines long. Flowers dull purplish red, 1½ inch long; the segments of the lower lip nearly as long as the tube, and very narrow. Fruit not known.

LIPHONOGLOSSA PILOSELLA. Monechma Pilosella, *Nees, l. c., p.* 412. Adhatoda dipteracantha, *Nees, l. c., p.* 396. Western Texas, on the Lower Rio Grande, and in the adjoining Mexican States, common; flowering throughout the summer. (No. 1458, *Wright*, 396, 1850, and 501, 1845, *Lindheimer.* Plant 6 to 12 inches high, suffruticose, much branched. Leaves half an inch to one and a half inch long. Flowers three-fourths of an inch long, pale purple. This plant is not a Monechma, for the capsule is 4-seeded, and the habit is different. It is still further removed from Adhatoda. We think it belongs to the genus Siphonoglossa, (*Œrsted, l. c., p.* 159,) the character of which must be slightly modified to receive it. The calyx is 5-parted and the narrow upper lip of the corolla is emarginate. The anther-cells are nearly parallel and placed one above the other; the lower one conspicuously mucronate, and the upper one less so. No. 1213 of Coulter's Mexican collection is apparently an undescribed species of this genus.

DIANTHERA AMERICANA, *Linn. Sp.* 1, *p.* 27; *Torr. Fl. N. York*, 2, *p.* 27. Justicia pedunculosa, *Michx. Fl.* 1, *p.* 7. Rhytiglossa pedunculosa, *Nees, l. c., p.* 339. Middle and western Texas.

ADATODA DIPTERACANTHA, *Nees, l. c., p.* 396. Rio Leona, Rio San Pedro and near Eagle Pass, Western Texas; March, April; *Schott, Bigelow.* (No. 1458, *Wright.*) Valley of the Conchos and near Los Garzas; *Gregg.* Monterey, Neuvo Leon; *Dr. Edwards.* A stouter form, more pubescent and with the stem decidedly shrubby at the base, was found on the mountains of Muerte by *Bigelow.* It is No. 434 of Wright's earlier collection, and may be Monechma Pilosella, *Nees.*

SERICOGRAPHIS CALIFORNICA (*Gray MSS.*): "foliis parvis ovalibus ovatis vel subcordatis, utrinque cum ramis teretibus pube molli brevissima tomentulosis; racemis brevibus laxifloris; floribus aut breviter aut longiuscule pedicellatis; bracteolis lineari-subulatis calyce brevioribus; corolla rubella longe tubulosa, labiis truncatis, superiore emarginato, inferiore 3-dentato; antherarum loculis subæqualibus sejunctis, inferiore basi calcare obtuso brevi incurvo auctis. Beloperone Californica; *Benth. Bot. Voy. Sulph. p.* 38? Jacobina Californica, *Nees in DC. Prodr.* 11, *p.* 729. Southern part of California; *Frémont.* Vallecita, California; *Thurber.* Although not agreeing in every respect with the description, these incomplete specimens probably belong to Bentham's Beloperone Californica, which Nees has not inaptly referred to his genus Jacobinia; but it surely belongs to Sericographis. It has the hairy lines, answering to the bases of the suppressed stamens, well-marked. In one blossom there were three perfect stamens. The upper lip of the corolla neatly shows the two long membranous lamellæ which connive and form a long channel containing in the bud the upper part of the style; a character which Œrsted has added to the description of this and some related genera." A. Gray.

ADHATODA? LONGIFLORA (n. sp.): caule erecto minute pubescente suffruticoso; foliis lanceolato-oblongis glabris sursum angustatis acutiusculis basi in petiolum attenuatis floribus fasciculatis axillaribus terminalibusque sessilibus, tubo corollæ elongato gracili. Road between Zuñi and Alta Sonora, September; *Schott.* Plant apparently about a foot high; branches erect and slender. Leaves (including the petiole) 1½–2 inches long and 3–5 lines wide, entire, nearly smooth. Flowers fascicled in the uppermost axils. Calyx a little shorter than the lanceolate bracts and longer than the subulate bracteoles, the segments subulate. Corolla white?; border 4-lobed, the three lower segments oblong, the upper segments bifid at the summit. Stamens 2, exserted; anther-cells separate, one placed above the other, obtuse at the summit, acute at the base. Ovary 4-ovuled. This seems to be distinct from any species of the genus described by Nees.

DICLIPTERA RESUPINATA, *Juss. in Ann. du Mus.* 9, *p.* 268 *fide Nees, l. c., p.* 474? D. thlaspoides, *Nees, l. c.* Santa Magdalena and Bacuachi, Sonora, September, October; *Thurber, Schott.* (No. 1465, *Wright.*) Our plant is a perennial, and some of the specimens seem to be even suffruticose, but D. resupinata and thlaspoides are said to be annuals. The length of the peduncle is variable; in *Schott's* and *Wright's* specimens it is as long as the lateral divisions, but in *Thurber's* they are sometimes very short, and the middle division much elongated. The heads, also, although mostly 1-flowered, are sometimes 2-flowered. The bracts are mostly broadly cordate, but in Mr. Thurber's specimens from Bacuachi they are ovate and obovate.

TETRAMERIUM NERVOSUM, *Nees in Benth. Bot. Sulph. p.* 148, *t.* 48. Var. hispidum foliis ovato-oblongis obtusiusculis vel acutis (non acuminatis.) Santa Cruz and Fronteras, Sonora, June, September; *Thurber.* Sierra de los Janos, in the same State; *Schott.* Rocky hills, Santa Rosa, Chihuahua; *Bigelow.* Valley of a mountain stream near Sonoita, Sonora; No. 1466, *Wright.* Sierra de San Carlos, Tamaulipas; *Berlandier*, No. 3181. Mexico; *Coulter*, No. 1206. Our

plant accords very nearly with the description and figure here quoted, but almost equally with the T. polystachyum and T. hispidum, which seem to be scarcely distinct from T. nervosum. The bracts are both appressed, and with spreading or even recurved tips, in the same specimen. The base of the stem is more or less woody.

TETRAMERIUM PLATYSTEGIUM (n. sp.): caule minutissime pubescente; foliis oblongo-lanceolatis inferioribus obtusis superioribus acutiusculis utrinque scabriusculo puberulis; spicis ovatis terminalibus; bracteis late cordatis acuminatis appressis membranaceis leviter 3-5-nervibus; calyce 5-partito; corolla bracteis subæquantibus, tubo gracili, limbi laciniis oblongis subæqualibus. Ringgold barracks near Rio Grande City, on the Lower Rio Grande; May; *Schott*. Stem much branched; the branches erect and slender. Leaves 1–2 inches long and 4–6 lines wide, abruptly narrowed at the base into a petiole which is 2–3 lines long. Spikes 1 to 1½ inch long. Bracts 6–7 lines long and 5–6 lines wide, with a short mucronate acumination, closely sessile, somewhat roughly puberulous. Calyx much shorter than the tube of the corolla, the segments subulate-lanceolate. Corolla purple, subbilabrate, the divisions obtuse. Stamens 2, inserted at the summit of the tube of the corolla; anther-cells parallel, contiguous, rather acute at the base. Stigma minute, capitate, 2-lobed. Capsule narrowed at the base, ovate above the middle, 4-seeded. Seeds lenticular, muricate. In the 5-parted calyx this species differs from Tetramerium, as the genus is characterized by Nees; but in T. ovatum, *Œrst.* the calyx is also 5-parted.

VERBENACEÆ.

BOUCHEA LINIFOLIA, *Gray in Sill. Jour.* (*ser.* 2,) 16, *p.* 98, (*sine desc.*): suffruticosa? glaberrima; ramis sulcato-angulatis; foliis linearibus vel lanceolato-linearibus acutissimis integerrimis; spicis laxiusculis; floribus subsessilibus; bracteis subulatis calyce multo-brevioribus; capsula calyce breviore. Valley of the San Pedro, Western Texas; September, October; *Schott*. (Nos. 436, 449, and 1509, *Wright*.) Plants a foot or more high, with long, slender, erect branches. Leaves 1—2 inches long and 1–2 lines wide. Spike 2–4 inches long. Calyx cylindrical; the subulate teeth scarcely one-fourth the length of the tube. Capsule obtuse, villous at the summit.

BOUCHEA SPATHULATA (n. sp.): suffruticosa; ramis teretibus; foliis crebris obovatis integerrimis obtusis vel brevissime mucronatis puberulis; spicis laxis; floribus sessilibus; bracteis foliaceis oblanceolatis, capsula calyce breviore acuta. Great Cañon of the Rio Grande near Mount Carmel; October; *Parry*. Plant 1–2 feet high. Leaves about three-fourths of an inch long, often fascicled in the axils and crowded on the short branchlets, somewhat scabro-puberulous. Bracts nearly as long as the calyx. Tube of the corolla nearly three-fourths of an inch long, and the limb half an inch in diameter.

BOUCHEA EHRENBERGII, *Cham.; Schauer in DC. Prodr.* 11, p. 558. Sonora, Mexico; *Thurber*. (No. 1508, *Wright*.)

LIPPIA WRIGHTII, *Gray in Sill. Jour. l. c.* Aloysia scorodonoides, *H. B. K. nov. Gen. & Sp.* 2, *p.* 260: ramis subtetragonis patentibus, junioribus pedunculisque pulvereo-canescentibus; foliis oppositis ovatis in petiolum brevem angustatis obtusis crenatis reticulato-rugosis supra scabro-hirtis subtus tomentoso-candicantibus; pedunculis axillaribus folium subæquantibus; spicis cylindricis laxiusculis; bracteis ellipticis acutis calyce longioribus; calyce ovato hirsuto, dentibus ovatis. Rocky hills along the Cibolo of the Rio Grande, August; near the Hot Springs, and on the Burro mountains; September, November; *Bigelow*. Presidio del Norte,

eptember; *Parry.* (No. 460 and 1506, *Wright.*) Sonora and Chihuahua, September, November; *Thurber.* A shrub 2–4 feet high, with numerous slender spreading branches. Leaves half an inch to three-fourths of an inch long, abruptly tapering at the base into a short petiole. Spikes 1–2 inches long in the axils of the upper leaves, often forming a terminal panicle. Flowers at first closely approximated, but becoming more or less distinct. Calyx densely clothed with white hairs, about a line long. Corolla nearly twice as long as the calyx.

Var. MACROSTACHYA: foliis basi subcordatis, spicis longissimis. Cretaceous rocks near Ringgold Barracks on the Rio Grande; June; *Schott.* West of Cerralbo; May; *Gregg.*

LIPPIA LYCIOIDES, *Stend. Nomencl. ed.* 2, *pars* 2, *p.* 54; *Schauer, l. c.* Rocky places along the Rio Grande and its tributaries from El Paso to the Gulf; also Chihuahua, Cohahuila and Nuevo Leon, April—October. (No. 1505, *Wright.* No. 2547 and 3004, *Berlandier.*) A shrub, commonly 3–5 feet high, but sometimes attaining the height of 10 feet. Flowers very fragrant.

Var. foliis ternis majoribus acutis grosse serrato-dentatis. Presidio del Norte; August; *Bigelow.*

Var. foliis oppositis pauci serrato-dentatis obtusis. Presidio de Rio Grande; *Parry.*

LIPPIA BERLANDIERI, *Schauer, l. c., p.* 575. Plains near San Felipe, September: also hills and stony places near Eagle Pass; *Bigelow.* Cretaceous hills on the Lower Rio Grande, March—October; *Schott.* Mount Carmel cañon, October; *Parry.* Plant suffruticose, 2–3 feet high. (Nos. 459 and 1507, *Wright*; Nos. 832 and 2252, *Berlandier.*)

LIPPIA GEMINATA, *H. B. K. Nov. Gen. & Sp.* 2, *p.* 215; *Schauer, l. c., p.* 582. On the Rio Grande, from Ringgold Barracks downward. This exactly accords with Berlandier's plant, except that the leaves are smaller.

LIPPIA NODIFLORA, *Michx. Fl.* 2, *p.* 15; *Schauer, l. c.* San Luis Rey, California, September; *Parry.* Common along the Rio Grande.

LANTANA CANESCENS, (*H. B. K. Nov. Gen. & Sp.* 2, *p.* 259; *Schauer in DC. Prodr.* 11, *p.* 607) foliis oppositis ternisve ovato-lanceolatis leviter crenato-serratis basi in petiolum brevem attenuatis supra scabriusculis subtus molliter incano-pubescentibus; pedunculis folium subæquantibus; capitulis vix involucratis demum ovatis. Santa Rosa, Cohahuila; *Bigelow.* This corresponds so minutely with the description of L. canescens *DC. Prodr.*, except in the leaves being sometimes ternate, that little doubt can exist as to its being the same species. It occurs in none of the collections but those of Dr. Bigelow.

LANTANA MACROPODA (n. sp.): suffruticosa, inermis, appresse hirsutula; foliis ovatis grosse et acute seratis basi abrupte attenuatis utrinque scabriusculis subtus pallidioribus; pedunculis folio 2–3-plo-longioribus; capitulis paullo elongatis; bracteis ovatis cuspidato-acuminatis, extimis majoribus involucrantibus; fructibus exsuccis. Ravines and rocky places on the Rio Grande, from the mouth of the Rio San Pedro to 200 miles above; flowering the whole season. Saltillo; *Gregg;* (Nos. 458 and 4513, *Wright.*) Stem 2–3 feet high, obtusely quadrangular. Leaves opposite, 1–2 inches long, somewhat scabrous with a short appressed hirsute pubescence; veins prominent underneath; petiole or attenuated base of the leaf, about half as long as the lamina. Peduncles 3—6 inches long; heads at first hemispherical, but at length ovate; the rhachis cylindrical and faveolate. Flowers sweet-scented; corolla white; the tube scarcely exserted. Mature fruit about the size of a hemp seed, nearly dry, with a thin sarcocarp; the endocarp bony costate-rugous; cocci cohering. Seeds suspended from the funicle which arises from near the base

of the cell; near the last, and L. hispida, *Kunth.*, but the latter species has serrato-crenate bullate-rugous leaves, and a juicy fruit.

LANTANA ODORATA, *Linn.; Schauer, l. c., p.* 603. Var. BERLANDIERI: foliis rhomboideo-oblongis acutiusculis supra scabriusculis subtus pallidioribus vix canescentibus. Ramos; Mexico, *Thurber.* (No. 3184, *Berlandier.*) Plant 1–3 feet high, slender. Leaves about an inch long. Peduncles (in Berlandier's specimens) much longer than the leaves. Flowers white.

LANTANA HORRIDA, *H. B. K. l. c. p.* 211. Var. PARVIFLORA, *Schauer, l. c. p.* 597. Near San Antonio, Texas; *Thurber.* Hills and dry prairies along the Rio Grande, also on the seacoast near Indianola; September—October; *Schott.* (No. 1511, *Wright*; Nos. 2114 and 2310, *Berlandier.*) Banks of the Escondido and near the Painted Caves; *Bigelow.* We name this plant on the authority of an authentic specimen of Berlandier's, No. 2310, which is certainly the same as ours. It is a shrub 3 or 4 feet high, often quite unarmed, and usually the prickles are sparse and extremely short. Flowers yellow, turning to a deep brown. The fruit is about the size of a peppercorn and is juicy when ripe. It may be only a variety of L. Camara.

VERBENA HASTATA, *Linn.; Torr. Fl. N. York,* 2, *p.* 51. V. hastata, *Lam. Ency.* 8, *p.* 548; *Schauer in DC. Prodr.* 11, *p.* 545. Near the Copper Mines, June—July; *Bigelow.*

VERBENA PROSTRATA, *R. Br. in Hort. Kew.* (*ed.* 2) 4, *p.* 41; *Schauer, l. c. p.* 547. Grassy places near Monterey, California; *Parry.*

VERBENA OFFICINALIS, *Linn.*; *Schauer, l. c.* Rocky places between Van Horn's Wells and Muerto, July; *Bigelow.* Seashore, near Galveston, Texas, September; *Schott.* Cañon of Guadaloupe, Sonora; *E. K. Smith.* San Diego, California; *Thurber.*

Var. HIRSUTA: incano-hirsuta, assurgens, bracteis calycem subæquantibus. Near the Copper Mines, New Mexico, June; *Bigelow.*

VERBENA CANESCENS, *H. B. K. Nov. Gen. & Sp.* 2, . 274, *t.* 136; *Schauer, l. c.* V. remota, *Benth. Pl. Hartw. p.* 21. Western Texas, along the Rio Grande, and in the adjoining Mexican States. (Nos. 1496 and 1497, *Wright.* Nos. 827, 955, 1485, 2054, and 2247, *Berlandier.* No. 77, (1846,) *Lindheimer.* No. 594, *Fendler.*) Some forms of V. officinalis approach this species; and V. strigosa, *Hook. Comp. Bot. Mag.* 1, *p.* 176, seems to be hardly distinct.

VERBENA BRACTEOSA, *Michx. Fl.* 2, *p.* 14; *Scnhauer, l. c., p.* 549. Sa Diego mountains, on the Rio Grande, and sandy places, El Paso, etc.; May—October; *Bigelow, Thurber.* (No. 1499, *Wright.*)

VERBENA AUBLETIA, *Linn.; Schauer, l. c., p.* 554. V. bipinnatifida, *Schauer, l. c.* Glandularia bipinnatifida, *Nutt. Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 184; common everywhere in Western Texas, New Mexico, extending to Chihuahua and Sonora. (Nos. 1501, 1502, and 1503, *Wright.*) Flowers throughout the season. We have in vain sought for characters to distinguish the two species here united. They vary in the number and form of the segments of the leaves. The ripe nutlets are the same in both. We know of no plants which, in the wild state, are more prone to hybridize than the North American species of this genus. Dr. Engelmann has enumerated (in Silliman's Journal, vol. ?,) many intermediate forms between V. officinalis, V. hastata, V. urticæfolia, and V. stricta, which he found in the vicinity of St. Louis, Missouri.

AVICENNIA TOMENTOSA, *Jacq.; Schauer in DC. Prodr.* 11, *p.* 699. Mouth of the Rio Grande, October—November; *Schott.* Also found, many years ago, at Tampa Bay, Florida, by *Dr. Leavenworth*, and at Key West by the late *Mr. Blodgett.*

LABIATÆ.

HYPTIS SPICATA, *Poir.; Benth. in DC. Prodr.* 12, *p.* 121? San Bernardino, Sonora, July; *Thurber.* Differs in the unequal teeth, the longer of which are not much shorter than the tube.

HYPTIS LANATA, *Benth. Bot. Sulph. p.* 42, *t.* 20. On the lower Gila; *Emory.* Major Rich found it also in lower California.

MENTHA CANADENSIS, *Linn.; Benth. in DC. Prodr.* 12, *p.* 173. Banks of the Mimbres, October; *Bigelow.* California; *Shelton.*

LYCOPUS EUROPÆUS, *Linn.* Var. SINUATUS, *Gray, Man. ed.* 2, *p.* 304. L. sinuatus, *Benth.*; L. exaltatus & L. sinuatus, *Ell.* River banks near San Luis Rey, California, October; *Parry.*

MONARDELLA UNDULATA, *Benth. in DC. Prodr.* 12, *p.* 190. Dana's Ranch, California; *Parry.*

MONARDELLA CANDICANS, *Benth. Pl. Hartw. p.* 330; *Torr. Bot. Whippl. Rep. p.* 123. Mountains east of San Diego, California, June; *Parry.* Also found by *Mr. Shelton.*

MONARDELLA ODORATISSIMA, *Benth. in. DC. Prodr. l. c.* Near San Diego, California, and on the mountains east, June; *Parry.*

MONARDELLA VILLOSA, *Benth. Bot. Sulph. p.* 42, *t.* 21. San Felipe, California, June; *Parry.* Var. LEPTOSIPHON: foliis integerrimis vel obsolete repando-dentatis; corollæ tubo calyce duplo longiore. Stem apparently assurgent. Leaves three-fourths of an inch long, ovate, abruptly tapering at the base to a petiole which is half the length of the lamina. Bracts ovate, acute, slightly colored. Head nearly an inch in diameter, about 30-flowered. Calyx oblong-cylindrical; teeth lanceolate, acute, nearly equal. Tube of the corolla slender, a little tapering upward; segments of the limb linear, rather acute, scarcely equal. Stamens exserted; anther-cells at length so much divaricate as to be in a line and almost confluent. Differs from the ordinary form of M. villosa in being much less hairy, the leaves not crenate-serrate (as they are in our California specimens, and in the figure quoted above), the longer petioles, less crowded heads of flowers, and especially in the long-exserted tube of the corolla.

MICROMERIA DOUGLASII, *Benth. Lab. p.* 372. Pine woods near Monterey, California, May; *Parry.*

MICROMERIA XALAPENSIS, *Benth. Lab. l. c.* San Antonio, Texas, April; *Thurber.*

CALAMINTHA GLABELLA, *Benth. in DC. Prodr.* 12, *p.* 230. Cunila glabella, *Michx. Fl.* 1, *p.* 13. San Antonio, Texas, April; *Thurber.*

POGOGYNE DOUGLASII, *Benth. Lab. p.* 414. Valley of the Sacramento, and frequent in other parts of California; *Fitch, Stillman, Shelton,* etc. We have never been able to distinguish satisfactorily more than one species of this genus. We have numerous forms of it, but they seem to pass into each other.

HEDEOMA MOLLIS (n. sp.): incano-tomentosa; foliis ovatis obtusis integris basi in petiolem brevem attenuatis; verticillastris 6–12-floris; floribus brevipedicellatis; calycibus cylindricis non gibbosis, dentibus brevissimis; staminibus inferioribus subexsertis, superioribus rudimentis sterilibus.—Cliffs near Puerte de Paysano, September; *Bigelow.* Plant somewhat ligneous at the base, which throws up several slender branches 12 to 15 inches in height. Leaves three-fourths of an inch long and 3 or 4 lines wide. Flowers crowded in axillary cymules. Calyx about 3 lines long, slightly curved, the teeth one-fifth the length of the tube. Corolla about as

long as the calyx. Upper lip a little notched. Lower lip 3-lobed; the middle lobe emarginate; lateral ones entire. Stamens 4; the two inferior ones perfect and nearly exserted; anthers with divaricate oblong cells; upper stamens reduced to simple short filaments.

HEDEOMA PLICATA (n. sp.): suffruticosa e basi ramosa; ramis erectis pubescentibus; foliis rhombeo-ovatis utrinque acutis argute serratis crebre et eximie penninerviis subplicatis, supra scabriusculis subtus pubescentibus; corollis calyce gibboso duplo longioribus. Dry ravines near the Limpio mountains, July; *Bigelow*. (No. 464 and 1718, *Wright*.) Branches about a span high, retrorsely pubescent. Leaves mostly shorter than the internodes, 3–4 lines long, of rather a thick texture, tapering to a petiole about a line in length, the numerous straight and parallel veins very prominent underneath. Verticils 2–6-flowered, the pedicels 1–2 lines long. Calyx gibbous at the base, distinctly 2-lipped; teeth of the upper lip ovate, mucronate, half the length of the subulate ones of the lower lip. Tube of the corolla exserted, more than half the length of the calyx; upper lip 3-lobed, the middle lobe longer and emarginate; the upper lip also emarginate.

HEDEOMA DENTATA (n. sp.): annua; ramis erectis gracilibus pubescentibus; foliis petiolatis oblongo-lanceolatis acutis pauci-dentatis; venis prominulis; verticillis remotis 6–10-floris; calyce subbilabiato vix gibboso, dentibus e basi lato-subulatis inequalibus, labii superiore divergentibus. Near Santa Cruz, Sonora, September; *Thurber*. Near the Copper Mines, October; *Bigelow*. About a foot high; much branching from the base, forming a bunch about a foot in diameter; the internodes of the branches rather distant. Leaves 5 lines long, tapering at the base into a short petiole, acutely 3–4-toothed on each margin; the veins underneath conspicuous, thicker at the extremity. Verticils usually not more than 6-flowered. Calyx slightly gibbous toward the base; teeth of the lower lip nearly twice as long as those of the upper. Corolla twice as long as the calyx. Upper lip emarginate; lower 3-lobed, the middle lobe notched. Near H. Drummondi, but in that species the leaves are entire with inconspicuous nerves, and the teeth of the calyx are all connivent.

Var. *nana:* foliis minoribus late ovatis vel ovato-oblongis interdum subintegerrimis. Rocky hills of the Rio Grande, near El Paso, April—May. Plant usually from 3 to 6 inches high, much branched from the base, incano-pubescent. Leaves one-third of an inch long. Bracts subulate, shorter than the pedicels. Verticils approximated, 3–12-flowered. Calyx evidently bilabiate, gibbous; upper teeth much shorter than the lower, subulate-lanceolate from a broad base; lower teeth subulate.

HEDEOMA INCANA (n. sp.): fruticosa, ramosissima, incana; ramis erectis foliosis; foliis linearibus vel oblongo-linearibus integerrimis obtusiusculis, axillis fasciculatis; verticillastris 4–6-floris, floribus subsessilibus; calycibus oblongo-cylindricis villosissimis subaequaliter 5-dentatis. Sandy places near El Paso, April—May; *Parry, Wright & Bigelow*. (No. 1523, *Wright*.) Plant about 2 feet high with the taste and odor of sage; the branches slender, sometimes apparently assurgent, slender, hoary, like the leaves, with a minute close pubescence. Leaves about three-fourths of an inch long, sessile, tapering at the base, flat. Flowers about 5 lines in length. Calyx densely villous with long white hairs; the teeth lanceolate. Corolla more than twice the length of the calyx; upper lip notched; lower 3-lobed, the middle lobe deeply emarginate; tube short, villous in the throat. Fertile stamens 2, a little exserted; the connective very thick; the anther-cells widely divaricate below, opening upward. Abortive rudiments of the superior stamens minute. Style strongly and rather unequally 2-cleft at the summit.

Allied to Keithia, but with a different habit, and a shorter corolla than in any of the described species of that genus. In the calyx it differs from both genera. It may remain in Hedeoma for the present, but, if other species like it should be found, it may be the type of a new genus.

HEDEOMA DRUMMONDI, *Benth. Lab. p.* 308, *& in DC. Prodr.* 12, *p.* 245. H. acinoides, *Scheele in Linnæa* 22, *p.* 592? Sandy hills, Mexico, western Texas, and Chihuahua. (No. 463, 1518, 1519, and 1522, *Wright.*; No. 620, *Fendler*, N. Mex.; No. 285, fasc. II. *Lindheimer.*) This species is certainly annual, and never perennial nor suffrutescent, as Bentham supposed it to be. It is a variable plant. Sometimes it is dwarf and cespitose; the leaves are linear-oblong or ovate, and sessile with a narrow base, or with a petiole nearly as long as the lamina; the calyx is more or less hairy, and when the plant grows in shady places the tube of the corolla is about the length of the calyx, while usually it is only about half as long. H. ciliata, *Nutt. Pl. Gamb. p.* 183, is probably only a variety of this polymorphous species.

SPHACELE CALYCINA, *Benth. Lab. p.* 568, *and in DC. Prodr.* 12, *p.* 255. (TAB. XXXVII.) Near Monterey, California, May; *Parry.* A strong plant, 2–3 feet high, somewhat shrubby at the base.

SALVIA LANCEOLATA, *Willd. Enum.* 1, *p.* 37; *Benth. in DC. Prodr.* 12, *p.* 299. S. trichostemoides, *Pursh, Fl.* 1, *p.* 19. Borders of the Rio Grande in western Texas, Chihuahua, and New Mexico; west to the Copper Mines. (No. 469, 470, and 1529, *Wright;* the last a very narrow leaved form. No. 606 *β* & 608, *Fendl.*, N. Mex., the former a small state of the plant.)

SALVIA AZUREA, *Lam.; Benth. l. c. p.* 302; *Bot. Mag. t.* 1728. S. angustifolia, *Michx. Fl.* 2, *p.* 13. S. Pitcheri, *Torr. in Benth. Lab. p.* 251. S. cæsia, *Scheele, in Linnæa*, 22, *p.* 588. Common along the Rio Grande, in New Mexico. S. farinacea, *Benth.* seems hardly distinct from this species. No. 468 *Wright*, is a narrow-leaved form.

SALVIA ALBIFLORA, *Mart. & Galeotti in Bull. Acad. Brux. v.* 11. *ex Benth. in DC. Prodr.* 12, *p.* 307. In damp situations, Santa Magdalena, Sonora; *Thurber, Schott.* Plant about 3 feet high, paniculately branched above, smooth. Lower leaves 1½–2 inches long and an inch broad, on petioles an inch or more in length, acuminate, mostly acute at the base, serrate. Whorls about 6 flowered, rather closely approximate, forming long racemes, which are nearly leafless. Pedicels two-thirds as long as the calyx. Upper lip of the calyx entire; lower 2-toothed. Corolla about 4 lines long; the upper lip strongly pubescent.

SALVIA SPICATA, *Roem. & Schult. Syst. Mant.* 1, *p.* 202; *Benth. l. c. p.* 315? Apache Springs, March; *Parry.* Our plant accords with the description of Roemer & Schultes, and it appears also to be the same as S. breviflora, *Moc. & Sessé.*

SALVIA BALLOTÆFLORA, *Benth. Lab. p.* 270. S. laxa, *Benth. in DC. Prodr.* 12, *p.* 313. On the Lower Rio Grande and its tributaries, and in the Mexican States south of the Gila; common. (No. 471, 472, 1524, and 1525, *Wright.* No. 821, 1431, 2240, and 3186, *Berlandier.*) A shrubby species, 2–5 feet high, variable in the form and size of the leaves. Flowers bright purplish-blue. Our numerous specimens show a gradual transition from S. ballotæflora to S. laxa. "The plant is used as an aromatic by the Mexicans, who call it Majorano," *Schott.*

SALVIA MICROPHYLLA, *H. B. K. Nov. Gen. & Spec.* 2, *p.* 294; *Benth. in DC. Prodr.* 12, *p.* 335. Mount Carmel, near the Great Cañon of the Rio Grande; *Parry.* Dry prairies between Elm creek and Turkey creek; *Schott.* Mr. Bentham, to whom I sent specimens of this plant, says, that it is "very near S. microphylla, but the leaves are almost entire and not rugose; the calyces also are longer." It is a shrubby and apparently somewhat spreading plant. The leaves are

oblong, obtuse, narrowed at the base into a short petiole, green and nearly smooth on both sides, and rarely with one or two teeth on each margin. The flowers are in terminal racemes. Corolla bright purplish-red, more than an inch long, the galea about two-thirds the length of the lower lip, and a little hairy.

SALVIA PSEUDO-COCCINEA, *Jacq.; Benth. in DC. Prodr.* 12, *p.* 343. Neuvo Leon; *Thurber.* I have specimens of what appears to be the same species, raised in the Cambridge (Mass.) botanic garden, from Texan seeds collected by Mr. Wright. Perhaps not sufficiently distinct from the next species.

SALVIA COCCINEA, *Linn. Mant. p.* 88; *Benth. l. c.* On the Rio Grande, from Laredo downward; *Schott, Dr. Edwards.* Los Nogales, Sonora; *Capt. E. K. Smith.*

SALVIA ROEMERIANA, *Scheele in Linnæa*, 22, *p.* 586. S. porphyrata, *Decaisne in Rev. Hortic.* 1854, *ex Hook. Bot. Mag. t.* 4939. Crossing of the San Pedro river, Texas, and on Live Oak creek, a tributary of the Pecos; also on mountains near the Rio Grande, in Chihuahua; *Bigelow.* Rio Mimbres, New Mexico; *Thurber.* (No. 473 and 1526, *Wright.*) This species varies greatly in the foliage. In the form represented in the *Bot. Mag. l. c.*, (which is the same as Wright's and Bigelow's from Live Oak creek,) the leaves are mostly simple, (rarely pinnatifid, with a pair of small remote segments,) broadly cordate, 1½–2 inches wide and coarsely runcinate-toothed. The description of Scheele applies to Thurber's specimens and to those collected by Bigelow in Chihuahua. It is a showy species, with large bright scarlet flowers.

SALVIA CARDUACEA, *Benth. Lab., p.* 302; *Bot. Mag. t.* 4874. S. gossypina, *Benth. Pl. Hartw. p.* 330. Near San Diego, California; *Parry.*

SALVIA COLUMBARIÆ, *Benth. l. c.; Torr. Bot. Whippl. Rep. p.* 123. San Pasqual, California, May; *Thurber.* Dry hills near San Diego, California; *Parry.* This plant is called *Chia*, by the native Californians. The seeds abound in mucilage, which is imparted to cold water, and the beverage thus obtained is much esteemed as a summer drink. *Thurber.*

SALVIA TEXANA. SALVIASTRUM TEXANUM, *Scheele in Linnaea*, 22, *p.* 585; *Torr. & Gray, Bot. Pope's Rep. p.* 169, *t.* 6. Western Texas and New Mexico, along the Rio Grande, mostly in high and dry situations. (No. 466, *Wright.* No. 1090 and 2520, *Berlandier.*) We have removed this plant to Salvia, from which it does not differ generically. It hardly accords with any of Bentham's section, but is nearest Heterosphace, from which it differs in habit and in the calyx closed by hairs.

AUDIBERTIA GRANDIFLORA, *Benth. Lab. p.* 312, *& in DC. Prodr.* 12, *p.* 359. (TAB. XXXVIII.) In woods near Santa Barbara, California, March; *Parry.* Stem herbaceous 2–3 feet high. Flowers bright crimson, large and highly ornamental.

AUDIBERTIA STACHYOIDES, *Benth. l. c.* Sandy hills, between San Diego and Monterey, March—May; *Parry, Thurber.* A common shrub in California.

AUDIBERTIA POLYSTACHYA, *Benth. l. c.* Abundant near San Diego, California, May; *Thurber.* Stem 3–4 feet high, slightly branched, bearing numerous spikes in a long terminal panicle.

MONARDA ARISTATA, *Nutt. Trans. Amer. Phil. Soc. n. ser.* 5, *p.* 186; *Benth. in DC. Prodr.* 12, *p.* 363. Between San Antonio and the Rio Grande, Texas, and from the Presidio del Norte to Laredo, April—September. A low form, which I think is M. pectinata, *Nutt. Pl. Gamb. p.* 182, was found by Dr. Bigelow at the Copper Mines, New Mexico. It is also No. 1531, *Wright.*

MONARDA PUNCTATA, *Linn.; Benth. l. c.* Sea shore near Galveston, Texas, September; *Schott.*

MONARDA FISTULOSA, *Linn.; Benth. l. c.* M. Lindheimeri, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 20. Copper Mines; July; *Bigelow.*

DRACOCEPHALUM PARVIFLORUM, *Nutt. Gen.* 2, *p.* 35; *Torr. Fl. N. York,* 2, *p.* 75; *Benth. in DC. Prodr.* 12, *p.* 400. Dry ravines, Organ mountains, April; *Bigelow, Wright.*

CEDRONELLA CANA, *Hook. Bot. Mag. t.* 4618. Near the Copper Mines; *Bigelow, Wright.* Burro mountains; *Bigelow.* Perhaps not distinct from C. Mexicana. No. 1532, *Wright,* has broadly cordate coarsely toothed leaves, which are 1½ inch long and more than an inch wide. In the specimens from the Copper Mines (No. 1533, *Wright*) the leaves are ovate or oblong, 8–10 lines long and rather sparingly toothed or almost entire. Our specimens from the Burro mountains have lanceolate leaves, of which only a few of the lowest are slightly toothed near the base.

CEDRONELLA PALLIDA, *Lindl. Bot. Reg.* 32, *t.* 29? Janos, Chihuahua, May; *Thurber.* Var. foliis ovato–oblongis basi acutiusculis. (No. 1534, *Wright.*) Differs from C. cana in the more dense and spike-like inflorescence, and in corolla being only a little longer than the calyx.

SCUTELLARIA TUBEROSA, *Benth. Lab. p.* 441; *Torr. Bot. Whippl. Rep. p.* 123. Near Monterey, California; *Parry;* and Napa county in the same State; *Thurber.*

SCUTELLARIA RESINOSA, *Torr. in Ann. Lyc. N. York,* 2, *p.* 232; *Benth. in DC.* 12, *p.* 427. S. Drummondii, *Benth. l. c.* Mule Springs, May—August; *Thurber.* Wet places near the Flounce mountains, June; *Bigelow.* Lower Rio Grande; *Schott.* Valley of the Cocospera, Sonora, September; *Schott.* Presidio del Norte; *Parry.* Plant annual, but sometimes appearing to be suffrutescent, from the base becoming woody when old. Varies in pubescence, and with the leaves entire or crenate, as well as more or less broad. S. Drummondii passes by a gradual transition to S. resinosa.

SALAZARIA, Nov. Gen.

Calyx subglobosus, inappendiculatus, breviter bilabiatus, post anthesin valde auctus, vesiculoso–inflatus, reticulatus, labiis inæqualibus integris in ore parvo confluentibus. Corollæ tubus longe exsertus, recurvato–adscendens, superne in fauce dilatatus; limbo bilabiato, labio superiore concavo apice integro, inferiore patenti–convexo apice emarginato, lobis lateralibus brevibus cum labio superiore coalitis. Stamina vix exserta: antherae ciliatae, staminum inferiorum uniloculares, superiorum biloculares cordatae. Stylus apice subulatus, indivisus. Nuculæ depresso-globosæ tuberculosæ. Cotyledones radiculæ brevi incumbentes.—Frutex ramosissimus; foliis parvis petiolatis integris; racemis paucifloris terminalibus, floribus cæruleis.

S. MEXICANA. (TAB. XXXIX.) Ravines, Chihuahua, below Presidio del Norte, near the Rio Grande; *Parry.* This remarkable plant was first discovered by Col. Frémont, in 1844, on the Rio de los Angelos, a branch of the Rio Virgen, western New Mexico; but the specimens were too much injured for description. It is a shrub 2 or 3 feet high, with numerous slender spreading or reclinate branches, which are terete and hoary, with a minute appressed pubescence. The leaves are about half an inch long, petiolate, ovate or oblong–lanceolate, acute at the base, slightly pubescent, 3-nerved; petiole 2–3 lines long. Racemes 2–6-flowered, terminating the branches. Flowers on short pedicels, as large as those of Scutellaria galericulata, which they much resemble. Calyx, at first, with entire, very obtuse and equal lips, at length very much enlarged (nearly three-fourths of an inch in diameter) and bladder-like, with a contracted orifice. Corolla nearly an inch long; the upper lip concave and incurved; lower lip dilated, the sides somewhat reflexed, much shorter than the upper lip, to which they are

attached. Stamens scarcely exserted; the anthers approximated in pairs; the inferior (longer) pair with one of the cells abortive; lower pair with cordate, 2-celled anthers, the cells somewhat divaricate. Style long and filiform, not at all bifid at the summit. Nutlets depressed-globose, horizontal, nearly a line in the transverse diameter, roughened with minute tubercles. Seed conduplicate, or bent at an acute angle, so that the cotyledons are somewhat horizontal and incumbent on the radicle. One or more of the nutlets are commonly abortive.

Mr. Bentham (in the introduction to his Gen. & Spec. Labiat., p. xxix) says, that the embryo of all Labiatæ that he had examined is either straight or only slightly curved; the only exception being in Scutellaria, in which "it is curved backward in a peculiar manner." Salazaria exhibits the same peculiarity, that is, the cotyledons are incumbent. The rather short radicle is not applied close to the cotyledons, but makes an acute angle with them. This results from the flexure of the carpel itself, which commences at an early period, and at last the vertex approaches the base, as in Menispermum. The nutlets in Scutellaria are always more or less roughened with minute tubercles, or with thick scales which are imbricated retrorsely. In S. parvula there is a distinct horizontal wing, free from the tubercles, and surrounding the nutlet, thus making an approach to Periloma, in which they are narrowly 4-winged.

It is evident that Salazaria makes a near approach to Scutellaria, but its nearly regular and bladder-like inappendiculate fructiferous calyx, in which there is scarcely any distinction of upper and lower lip, distinguishes it sufficiently from that genus.

PHYSOSTEGIA VIRGINIANA, *Benth. Lab. p.* 504. Dracocephalum Virginianum, *Linn. Sp. p.* 828. Western Texas; *Wright.*

BRAZONIA TRUNCATA, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 47; *Benth. l. c. p.* 434. Near Austin, Texas, May; *Wright.*

MARRUBIUM VULGARE, *L.; Benth. in DC. Prodr.* 12, *p.* 453. Santa Cruz, Sonora, May; *Capt. E. K. Smith.* Doubtless introduced by the Spaniards.

STACHYS COCCINEA, *Jacq.; Benth. in DC. Prodr.* 12, *p.* 467. Near the San Pedro river and in other parts of Sonora; also in Chihuahua; *Thurber.* Tubac, Sonora, March; *Parry.* Copper Mines, New Mexico, August; *Bigelow.* (No. 1527, *Wright.*) Our plant is smoother than the ordinary of the species. We have specimens of a Stachys, collected by Dr. Bigelow in rocky places near the Limpia mountains, which we think is a variety of S. coccinea, but the flowers are much smaller.

STACHYS AGRARIA, *Cham. & Schlecht. in Linnæa*, 5, *p.* 100; *Benth. l. c. p.* 479. S. umbrosa, *Scheele in Linnæa*, 22, *p.* 695. Near Santa Antonio, and in other parts of Texas; *Wright*, No. 1535.

STACHYS PALUSTRIS, *Linn.?; Benth. l. c.* Near San Diego, California, May; *Thurber.*

TRICHOSTEMA LANATUM, *Benth. Lab. p.* 659. (TAB. XL.) Solidad, above San Diego, California, June—July; *Parry;* also found near San Antonio, in the same State, by Dr. Andrews. Pubescence purplish and velvety. Stamens exserted two inches. Plant fragrant.

TRICHOSTEMA DICHOTOMUM, *Linn. Benth. l. c.* Western Texas. (No. 1541, *Wright.*)

TETRACLEA COULTERI, *Gray in Sill. Jour.* (2 *ser.*) 16, *p.* 97. (TAB. XLI.) Rocky hills on the Rio Grande, from Eagle Pass upward to El Paso; July—October. Sierra del Pajarito, June, *Schott,* and San Bernardino, Sonora, April; *Capt. E. K. Smith.* Mr. Bentham having in a recent letter communicated to me his opinion that Tetraclea is a true Labiate plant, and hardly distinct from Trichostema, Dr. Gray makes the following remarks: "Tetraclea Coulteri is most nearly allied to Trichostema, § Orthopodium, as Mr. Bentham suggests. But it differs in the

equally spreading (not declined) lobes of the corolla, and the equal stamens with parallel anther-cells. If the published character of *Trichostema*, and of the order were perfectly correct, it would also differ importantly in the amphitropous descending ovule. But in Trichostema, also, the ovules are amphitropous or between that and anatropous. The seed, however, is attached below the middle, whereas in Tetraclea it is attached above the middle; but this is merely a difference of degree. The anthers are not drawn quite right in the plate. They are scarcely emarginate at the upper, but deeply lobed at the lower end, and perfectly opposite or parallel."

TEUCRIUM CANADENSE, *Linn. Benth. in DC. Prodr.* 12, *p.* 581. Santa Cruz Valley Sonora; *Schott, Thurber.* West of Cerralbo; *Gregg.* (No. 1542, *Wright.*)

TEUCRIUM CUBENSE, *Linn.; Benth. l. c. p.* 578. T. laciniatum, *Torr. in Ann. Lyc. N. York,* 2, *p.* 231; *Benth. l. c.* Common in plains and low places throughout western Texas, N. Mexico, Sonora, etc., June—September. (No. 1544, *Wright.*)

BORAGINACEÆ.

CORDIA PODOCEPHALA (n. sp.): ramalis teretibus subcapitatis; foliis ovato-lanceolatis obtusiusculis basi angusto-cuneatis grosse serrato-dentatis utrinque ramulisque scabro-hirsutis; pedunculis axillaribus terminalibusque elongatis erectis; capitulis globosis; calyce ovato strigoso acute 5-dentato. Near San Antonio, Texas; October; also prairies and alluvions of the Rio Grande from the San Pedro to the Pecos; *Schott.* Plains and grassy places, Piedra Pinta, Texas; September—October; *Bigelow.* Near Monterey, Mexico; *Gregg, Dr. Edwards.* (Nos. 456 and 1510, *Wright.*)

Plant 1–2 feet high, nearly simple or moderately branched. Leaves 1–1½ inch long, and 3–5 lines wide; 4–6-toothed on each margin; scabrous on both sides, with short appressed hairs, which commonly arise from an elevated base. Peduncles solitary in the axils, 2–6 nches long. Heads (exclusive of the corolla) about one-third of an inch in diameter; the flowers closely aggregated. Corolla funnel-form, with a short tube, half an inch long and of equal diameter; white or pale rose color; the lobes short and slightly emarginate. Fructiferous calyx somewhat enlarged, the teeth triangular-ovate. Stamens included. Style long and filiform; the apex twice 2-cleft. Ovary 4-celled, the ovules ascending. Drupe about the size of a hempseed (Canabis); pulp very thin; endocarp reticulate-pitted. Cotyledons distinctly plicate longitudinally. Apparently allied to C. patens. An undescribed species of this genus was found by Gregg in the Balson de Mapimi. It may be thus characterized:

CORDIA GREGGII, (n. sp.): ramosissima, scabro-pubescens; foliis obovatis obtusis dentatis plicato-rugosis, basi longe cuneatis; cymis contractis subcapitatis paucifloris; laciniis calycis setaceis tubo campanulato brevioribus; corolla glabra infundibuliformi-campanulata. In the northern part of the Balson de Mapimi, flowering in April. A shrub 5–8 feet high. Leaves scarcely half an inch long, of a pale greenish gray color. Peduncles terminating the leafy branches, an inch long. Cymes 8–12-flowered, the flowers at first in a dense head, but afterwards unfolding a little. The upper part of the 5–6-toothed calyx clothed with short blackish hairs. Corolla more than an inch in diameter, white; the lobes obtuse and entire. Stamens 5–6, scarcely half the length of the corolla. Ovary tapering to a long slender style. Ovules ascending. This species connects the sections Dasycephalæ and Cordiopsis. It is allied to C. parvifolia, but has a much more contracted inflorescence.

CORDIA BOISSIERI (*Alph. DC. Prodr.* 9, *p.* 478,): foliis ovatis utrinque obtusis vel apice acuti-

usculis; interdum serrulato-repandis supra scabriuscule pubescentis subtus velutino-tomentosis; pedunculis corymbosis rufo-tomentosis; calyce cylindraceo-ovato, dentibus subulato-acuminatis; corolla infundibuliformi calyce duplo-longiore glabriuscula. Near Monterey, Mexico; *Dr. Edwards, Gregg.* New Leon; *Thurber.* May. Cretaceous hills around Ringgold Barracks on the Rio Grande; *Schott.* (No. 304, *Berlandier.*) A shrub or small tree, sometimes attaining a height of 15 or 20 feet. Leaves 3–4 inches long, and 2–3 inches wide. Flowers in terminal corymbs. Corolla an inch and a half long, white, with a yellow centre. Stamens 5, shorter than the corolla; filaments slender; anthers oblong. Style twice bifid; the lobes obtuse, flattish. Fruit enclosed in the enlarged calyx, oblong, with a thin pulp. Endocarp thick and bony. Albumen none; cotyledons foliaceous, much plicate and veiny. The Mexicans call this plant Nacahuita. Dr. Gregg says that the fruit is eaten by cattle and hogs, and that a decoction of the leaves is used for pains in the limbs. It is closely allied to C. Sebestena, *Linn.* (C. speciosa, *Willd.*, which grows on Key West); but differs in the soft velvety undersurface of the leaves, the shorter calyx with more pointed teeth, etc.

Ehretia elliptica, *DC. Prodr.* 9, *p.* 503. Texas; *Wright.* Near Corpus Christi; *Major Eaton.* Near Monterey, Mexico to Camargo; *Gregg.* Santa Rosa, Chihuahua; *Bigelow.* Between Ringgold Barracks and the mouth of the Rio Grande; *Schott.* September. (Nos. 233, 236 and 900, *Berlandier.*) A tree 20–30 feet high, and often nearly a foot in diameter, with gnarled branches. Flowers sometimes tetramerous. Fruit the size of a large pea, yellow, with a thin edible pulp.

Ptilocalyx Greggii, *Torr. & Gray, Bot. Pope's Rep. p.* 14, *t.* 8. Rocky places on the Rio Grande, from El Paso to the Presidio. (Nos. 492 and 1583, *Wright.*) A shrub 1–3 feet high, with small oval leaves; remarkable for the spherical clusters of flowers and plumose calyx-segments.

Stegnocarpus canescens, *Torr. & Gray, l. c., p* 13, *t.* 7. Coldenia? (Stegnocarpus) canescens, *DC. Prodr.* 9, *p.* 559. Dry hills near El Paso, etc., March—May. (Nos. 836, 959, 2256, 2389, *Berlandier.*)

Tiquilia brevifolia (*Nutt. herb.*): annua; foliis ovatis, 3–4 veinis; staminibus inclusis. *Torr. in Bot. U. S. Expl. Exped. ined. t.* 12. Desert west of the Colorado, California, March; *Schott.* This plant was found by Major Emory in 1846, in the same desert; but his specimens were collected in the winter, and were too imperfect for determination. T. dichotoma, *Pers.*, (Coldenia? dichotoma *DC.*,) differs in being suffrutescent and in having lanceolate leaves. Late in the season the leaves become rigid and hispid. The remarkable character of the lobed cotyledons in this genus was pointed out to my friend Dr. Gray many years ago. It is fully described in the Botany of the United States Exploring Expedition. Mr. Bentham has noticed it in *Hook. Jour. Bot. & Kew Miscell.* 3, *p.* 296.

Var. plicata: foliis oblongis utrinque 5–7-veniis plicato-rugosis. With the preceding. Leaves remarkably plicate between the veins. Late in the season the stem of this becomes hard and ligneous, so that, without examining the root, the plant might be considered as frutescent.

Eddya hispidissima, *Torr. & Gray, Bot. Pope's Rep. p.* 170, *t.* 9. Gravelly hills near El Paso, New Mexico; March—May. (Nos. 485 and 1557, *Wright.*)

Heliotropium Curassavicum, *Linn.; DC. Prodr.* 9, *p.* 538. Sandy places, especially on the

banks of rivers throughout western Texas and New Mexico, and west of the Pacific; flowering from April to September. Dr. Parry found it in abundance on the beach near San Diego.

HELIOTROPIUM INUNDATUM, *Swartz Fl. Ind. Oc.* 1, *p.* 343; *Gray & Engelm. Plant. Lindheim. p.* 18. Sandy plains, Eagle Pass, September; *Bigelow.* Near the Pecos; *Schott.* Dr. Edwards and Major Eaton found the plant near Monterey, Mexico, and Dr. Gregg at Matamoras. Alexandria, Louisiana; *Dr. Hale.* (Nos. 700, 917 and 2117, *Berlandier.* No. 1550, *Wright.*) All our specimens are evidently annual; but De Candolle has described it as fruticulose. The root does, indeed, as in many other annuals of this dry country, become quite woody late in the season. The nutlets are ovate and villous, and their face marked with 2 small ovate protuberances, but with no foveolæ.

HELIOTROPIUM PHYLLOSTACHYUM (n. sp.): annuum, diffuse ramosum, strigoso-hirsutum; foliis lanceolatis basi in petiolum brevem attenuatis; spicis solitariis interrupte foliaceis; floribus sessilibus; lobis calycis lanceolatis inequalibus; corollæ tubo longitudine calycis extus piloso; antheris superne attenuatis apice puberulis; nuculis subglobosis extus strigulosis intus bifoveolatis. Western Texas, No. 1551, *Wright.* We have the same plant, collected near Monterey, Mexico, by Dr. Edwards and Major Eaton, and from Key West sent by the late Mr. Blodgett. It is also No. 1538 and 3038 of Berlandier, who collected it at San Fernando, Cohahuila. Plant more or less branched and diffuse; the branches 3–5 inches long, of a grayish aspect. Leaves 6–8 lines long and 2–2½ lines wide, scabrously hirsute; the hairs arising from a little callous tubercle. Spikes many-flowered; many of the flowers ebracteate, others furnished with a large foliaceous bract which resembles the proper leaves. Flowers small: corolla apparently white, the lobes lanceolate and erect. Stamens inserted at the lower part of the corolla-tube; anthers somewhat hastate. Style very short; stigma conical from a broad base. Nutlets about half a line in diameter, with two deep pits on the face. It belongs to the section *Orthostachys.*

HELIOTROPIUM GREGGII (n. sp.): suffruticosum, e basi ramosum, prostratum; foliis lanceolato-linearibus obtusiusculis pilis brevibus adpressis hirsutis; spicis paucifloris parce foliaceis bracteatis, floribus sessilibus; corolla calyce duplo longiore, limbo plicato, laciniis brevissimis; antheris apice barbulatis; stigmate superne attenuato; nuculis subglobosis hispidis facie bifoveolatis. Sandy places near El Paso, April; *Bigelow.* Near Chihuahua, August; *Thurber.* (No. 487 and 1548, *Wright.*) Valley of Conchos, near Santa Rosalia, May; *Gregg.* Boca Grande, Caracalio, March—April; *Capt. E. K. Smith.* Stems prostrate, 3–8 inches long. Leaves 6–10 lines long, rarely 2 lines wide. Spikes at first distinctly circinate, mostly few flowered, but sometimes 15–20-flowered, irregularly foliaceous. Flowers on short pedicels, white, odorous. Corolla 3–4 lines in diameter, the limb spreading and strongly plicate; lobes short with intermediate shorter ones in the sinuses. Stamens inserted about the middle of the tube of the corolla; anthers oblong, acute, at first coherent by their villous tips, but at length distinct. Style very short; stigma with a broad truncated base and tapering upward. Carpels hispid with short erect hairs; the face contracted and marked with 2 minute foveoles. Mr. Thurber informs me that the flowers are very fragrant.

HELIOTROPIUM ANGUSTIFOLIUM (n. sp.): suffruticosum, ramosissimum, erectum, adpresso-hirsutum, incanum; foliis linearibus vel lanceolato-linearibus acutis basi angustatis; spicis dichotomis vel solitariis ebracteatis; floribus brevissime pedicellatis post anthesin patulis vel nutantibus; corollæ tubo calycem subæquante; stigmate e basi subgloboso elongato; nuculis subglobosis hispidis intus bifoveolatis. Western Texas and along the Rio Grande, south to Eagle Pass,

March—October. Near Monterey, Mexico; *Dr. Edwards and Major Eaton.* (No. 480 and 1546, *Wright.*) Plant about a foot high; often several stems from one root; branches terete, slender, erect. Leaves 6–10 lines long, half a line to a line in breadth, often crowded. Spikes at first short, but in fruit 2 or 3 inches long, slightly circinate when young. Calyx a little shorter than the tube of the corolla; the lobes lanceolate, equal, erect. Corolla apparently white, about 2 lines long; lobes lanceolate, acute, spreading, or somewhat erect. Stamens inserted in the middle of the tube of the corolla; anthers oblong, smooth at the tip. Stigma elongated and narrow, from a somewhat dilated base; style as long as the ovary. Nutlets often alternately smaller, with a narrow face, which is marked with 2 distinct pits.

HELIOTROPIUM LIMBATUM, *Benth. Pl. Hartw. p.* 20, *No.* 154; *DC. Prodr.* 9, *p.* 543. Murin, Mexico; *Thurber.* San Carlos, Mexico; *Berlandier*, No. 3199. Monterey, Mexico; *Dr. Edwards and Major Eaton.* A small prostrate much branched species. Stem suffruticose. Leaves about 3 lines long, cinerous, hispid, patulous. Spikes very short, few-flowered, mixed with leaves at the extremity of the branches. Limb of the corolla much dilated and undulate, angularly 5-lobed. Anthers a little coherent and bearded at the tip. Style 3 times as long as the ovary. Stigma conical from a dilated subglobose base; bifid at the apex. This species seems to be nearly allied to H. humifusum, *H. B. K.*

HELIOTROPIUM LIMBATUM, var. CONFERTIFOLIUM: caulibus robustioribus, ramulis suberectis; foliis lanceolato-linearibus confertissimis subappressis. Plains near Leon Springs, September; *Bigelow.* San Vincente; *Parry.* Cerralvo, *Gregg.* (No. 481 and 1547, *Wright.*) This is a much stouter and larger plant than Bentham's, and differs strikingly in its narrower, somewhat appressed and crowded leaves. Flowers pale purple (*Gregg*).

HELIOTROPIUM TENELLUM, *Torr. in Marcy Report, t.* 14. Lithospermum tenellum, *Nutt. Fl. Arkans. in Trans. Amer. Phil. Soc. n. ser.* 5, *p.* 189. L. angustifolium, *Torr. in Ann. Lyc. N. York*, 2, *p.* 225, *non Michx.* (where the nutlets are incorrectly described as smooth and polished.) High plains near Howard's Springs, and Rio San Pedro, western Texas, October; *Schott.* (No. 1559, *Wright.*) Western Texas; *Marcy.* Prairies near San Augustin, Texas; *Leavenworth.* On the Red river, Louisiana; *Dr. Hale.* Tennessee; *Mr. Curry.* Plant about a foot high, often much branched. Leaves an inch long and 1–1½ line wide. Racemes few-flowered, naked or somewhat leafy; the flowers distant, conpicuously pedicellate. Calyx very unequally 5-parted; the segments lanceolate-linear, in fruit much longer than the nutlets. Corolla white, 2½ lines long; the lobes obovate-oblong and rather obtuse. Anthers oblong, slightly bearded at the tip. Stigma nearly sessile, oblong, tapering upwards, bifid at the summit. Nutlets subglobose, the upper part appressed-pubescent, below the middle (and often also above) reticulated, not verrucose as represented in the figure quoted above, without foveoles on the face.

HELIOPHYTUM PARVIFLORUM, *DC. Prodr.* 9, *p.* 553. Heliotropium parviflorum, *Linn.* Plains near Eagle Pass, September, (fruit); *Bigelow.* Lower Rio Grande, in various places, April—May; *Schott.* Monterey, Mexico; *Dr Edwards, Gregg.* We have specimens also from Key West, Florida, collected by Blodgett.

HELIOPHYTUM (CŒLOMA) MOLLE (n. sp.): suffruticosum, griseo-velutinum; foliis deltoideo-ovatis basi in petiolum abrupte angustatis margine undulatis; pedunculis terminalibus bifidis spicis conjugatis nudis scorpoideis; floribus sessilibus; calycis lobis lanceolatis corollæ tubo paullo brevioribus; corollæ lobis obtusis crenulato-undulatis: fructu subgloboso velutino apice integro,

loculis in utroque segmento lateralibus lacuna magna centrale interposita. Plains near Presidio del Norte, August, fl. and fr.; *Bigelow*. Plant about a foot high, the stem a little woody at the base. Leaves alternate, 2 inches long, and an inch or more wide, clothed (like the stem) with a soft velvety pubescence, the veins underneath very distinct. Spikes 1½–2 inches long, and not much elongated in fruit, at first strongly circinate, the flowers closely approximated. Corolla about 2½ lines long, white, infundibuliform. Anthers oblong. Stigma subsessile, conical from a broad base, pubescent. Fruit about 2 lines in diameter, segments 2-seeded, with a large central lacune interposed, besides 1–2 smaller lateral ones.

HELIOPHYTUM (CŒLOMA) GLABRIUSCULUM (n. sp.): caule herbaceo erecto e basi ramoso adpresse pubescente; foliis alternis lanceolatis, obtusiusculis basi in petiolum attenuatis utrinque viridis glabriusculis; spicis solitariis geminatis vel ternatis, junioribus scorpoideis; floribus brevissime pedicellatis approximatis ebracteatis; calycis lobis lineari-lanceolatis; corollæ lobis oblongis obtusis; fructu compresso subdidymo puberulo apice integro ad suturas late excavato, segmentis dispermis, lacuna centrali interposita præterea lacunarum 2 minorum lateralium. Sandy plains, Eagle Pass, September; *Bigelow*. (No. 1549, *Wright*.) About a span high; the lower branches spreading and perhaps prostrate. Leaves an inch long and 2–3 lines wide, a little hairy on the midrib underneath, the rest nearly smooth; the margin somewhat undulate. Peduncles terminal, bearing from one to three spikes, which are about an inch in length. Corolla white, the border dilated, deeply 5-lobed; the lobes slightly undulate. Stamens inserted about the middle of the tube; anthers sessile, fixed near the middle of the back, lanceolate, acute. Stigma about as long as the subglobose ovary, nearly sessile, conical from a broad annular base. Fruit didymous, the apex truncate, concave and 4–6-denticulate; the segments sometimes only 1-seeded by abortion, with 3 empty cells, the central one (near the commissure) larger, the others lateral and much smaller.

EUPLOCA CONVOLVULACEA, *Nutt. in Trans. Amer. Phil. Soc. n. ser.* 5, *p.* 189; *Hook. Ic. t.* 651; *Torr. in Marcy's Rep. p.* 294, *t.* 15. Valley of the Rio Grande, from Presidio del Norte upwards, July—October. Chihuahua; *Thurber*. (*Wright*, No. 1553.) In the centre of each division of the fruit there is a small empty cell or lacuna, which is seen only when a cross section is made midway between the base and the apex. This genus is intermediate between Tournefortia § Arguzia, and Heliophytum.

MACROMERIA VIRIDIFLORA, *DC. Prodr.* 10, *p.* 68? Copper Mines, New Mexico, June—August; *Bigelow, Thurber*. (No. 1558, *Wright*.) Plant two or three feet high; erect. Stem hispid with spreading hairs. Leaves ovate, lanceolate, 2–3½ inches long, and 6–12 lines wide, the upper surface hispid with hairs which arise from an elevated callous base; the under side either hispid or somewhat softly villous with closely appressed hairs. Flowers nearly an inch and a half long, tubular-funnelform, greenish and very hairy externally; yellow inside. Calyx about one-fourth the length of the corolla; the divisions much elongated in fruit. Stamens at first included, but at length exserted. Nutlets ovate, more than a line long, smooth, and shining. Our plant agrees sufficiently well also with the description of M. viridiflora.

ONOSMODIUM CAROLINIANUM, *DC. Prodr.* 10, *p.* 70. San Antonio, Texas; *Thurber*. We have intermediate forms which seem to connect O. Virginiana and O. molle with this species.

LITHOSPERMUM CANESCENS, *Lehm. Asp.* 2, *p.* 305; *DC. Prodr.* 10, *p.* 78. Copper Mines, New Mexico, and Mountain Arroyos, near Camp Bache, June—July—August; *Bigelow, Thurber*.

Sierra San Luis, Chihuahua, September; *Schott.* No. 1653, *Wright*, seems to be only a narrow-leaved form of this species.

LITHOSPERMUM LONGIFLORUM, *Spreng. Syst.* 1, *p.* 554. L. incisum, *Lehm. l. c.* Pentalophus longiflorus, *DC. Prodr.* 10, *p.* 86. Banks of streams, cañon of Guadalupe, Sonora, April; *Captain E. K. Smith.* Near the Copper Mines, Ben Moore, Santa Barbara, and Mimbres, April; *Bigelow.* Apache Springs, March; *Parry.* Hueco mountains, Texas, and Ojo de Vaca, Chihuahua; *Thurber.* Nutlets ovate, white and shining, marked more or less with shallow pits. After flowering the plant becomes more branched, and produces narrower and more crowded leaves.

LITHOSPERMUM BREVIFLORUM, *Englm. & Gray, Pl. Lindh. p.* 44. Western Texas; (*Wright*, Nos. 1560 and 1561.) Nutlets as in the last.

LITHOSPERMUM MATAMORENSE, *DC. Prodr.* 10, *p.* 76. On the Lower Rio Grande; (*Wright*, No. 1564.) Near Monterey, Mexico; *Dr. Edwards and Major Eaton.* Our plant agrees very well with Berlandier's own specimens.

AMSINCKIA LYCOPSOIDES, *Lehm. Del. Sem. H. Hamb.* 1831, *p.* 7; *DC. Prodr.* 10, *p.* 117. Journado between Tucson and the Gila, Sonora; also grassy places near San Diego, California, March; *Parry.*

AMSINCKIA INTERMEDIA, *Fisch. & Mey. Ind.* 2, *Sem. Petrop.* 1835, *p.* 26; *DC. l. c.* Alluvions of the Gila, Sonora, and near San Diego, California, March; *Parry.* The insertion of the stamens is not constant in this genus. In the same species they are sometimes placed near the base of the corolla; sometimes in the upper part of the throat. Perhaps all the species with rugose nutlets are forms of A. lycopsoides.

ERITRICHIUM GLOMERATUM, *DC. Prodr.* 10, *p.* 131. Myosotis glomerata, *Nutt. Gen.* 1, *p.* 112, *Hook. Fl. Bor.-Amer.* 2, *p.* 82, *t.* 162. Near El Paso and Doña Ana, March—April. (No. 1566, *Wright.*) New Mexico; *Fendler.* No. 632. About a foot high. Root perennial. Hairs of the calyx and of the upper leaves yellowish. Nutlets closely fitted to each other, forming a depressed globose fruit, margined; the back strongly rugulose transversely and more or less verrucose.

Var. HISPIDISSIMUM is more hispid, and seems to be biennial. Common in New Mexico.

ERITRICHIUM JAMESII, *Torr. in Marcy Rep. p.* 294. Myosotis suffruticosa, *Torr. in Ann. Lyc. New York*, 2, *p.* 225. Near the Copper Mines, New Mexico, and Mule Springs, March—June, El Paso, and Journado del Muerto, March—April; *Thurber.* Dry ravines, San Luis, Sonora, April; *Captain E. K. Smith.*

ERITRICHIUM HELIOTROPIOIDES. Antiphytum heliotropioides, *Alph. DC. in Prodr.* 10, *p.* 122. Sandy shore of the Rio Grande at Eagle Pass; *Schott.* No. 1512, *Wright.* Valley of the Limpio; *Bigelow.* Dry plains southwest of Escondido, May, (1847,) and Saltillo, (1848 and 1849;) *Dr. Gregg.* Our specimens agree in all respects with Berlandier's. The leaves are not opposite, and we have little doubt that the plant should be referred to Eritrichium, § Rutidocaryum. The root is annual, but in old plants the stem becomes hard and ligneous.

ERITRICHIUM (RUTIDOCARYUM) FLORIBUNDUM (n. sp.): caulibus erectis basi simplicibus superne paniculatim ramosissimis foliisque adpresse cinereo-pubescentibus; foliis lanceolatis seu linearibus acutiusculis; racemis brevibus paniculatis paucifloris parcebracteatis; corolla campanulata, lobis rotundatis; nuculis late-ovatis acutiusculis densissime verruculosis. Mountains of Puerte de Paysano, September, fl. and fr.; *Bigelow.* Also in low places near Rock Creek. Root apparently perennial. Stem 2–3 feet high. Leaves 1–1½ inch long; the radical ones 3–4 lines wide, lanceolate or lanceolate-spatulate; the cauline 1–2 lines wide. Racemes lateral

and terminal, forming a long, somewhat contracted panicle, 3–8-flowered, at first circinate; flowers approximated, on short pedicels. Segments of the calyx linear, somewhat hispidly pilose. Corolla white, about one-third longer than the calyx; the tube very short; border much dilated. Stamens scarcely exserted. Nutlets nearly a line long, the face acutely carinate, and a small prominence near the base, where it is attached to the style; the back strongly convex.

ERITRICHIUM PUSILLUM, *Torr. & Gray, in Bot. Pope Rep. p.* 15. Dry hills and rocky places near El Paso, March; *Bigelow, Wright.* Santa Maria, Chihuahua, March; *Parry.*

ERITRICHIUM CRASSISEPALUM, *Torr. & Gray, l. c.* Dry soils in various places along the Rio Grande, from Eagle Pass upward to El Paso, westward to Gaudalupe Pass, Sonora, March—April.

ERITRICHIUM MICRANTHUM (n. sp.): annuum, pusillum, canescenti-hispidum; caule e basi ramosissimo; foliis linearibus obtusis; racemis brevibus longe bracteatis; floribus confertis, corolla minutissima, fauce nudo; nuculis oblongis acutiusculis glaberrimis dorso convexis angulo interno prominente sulcato. Sand hills, Frontera, Texas, and in other places along the Rio Grande, March—April; *Thurber.* (*Wright*, No. 1565.) Stem 2–4 inches high, much branched from the base, and apparently diffuse when old; the branches very slender. Leaves 3–4 lines long, and scarcely more than half a line wide. Racemes at first capitate and crowded with short leafy bracts, unfolding gradually, but never more than half an inch long, the flowers so close together as to be imbricated, with foliaceous bracts at the base longer than the calyx. Segments of the calyx linear. Corolla less than a line in length, separating early from the base, but remaining on the flower like a calyptra, the tube narrow, and about as long as the calyx; no traces of appendages; the lobes small and ovate. Stamens inserted about the middle of the corolla-tube, nearly sessile. Nutlets about one-third of a line long, narrowly oblong, shining, apparently adhering to the column (which is very broad at the base,) by the whole length of the sulcate inner angle. This species is allied to Krynitzkia, and also to the section Cryptantha of Eritrichium, differing from the first in the persistent calyx, and in wanting the appendages of the corolla, from the latter in the homomorphous flowers and smooth nutlets.

ERITRICHIUM ANGUSTIFOLIUM, *Torr. in Pacific Railroad Reports*, 5, *p.* 363. On the Rio Gila; *Thurber.* Cañon of Guadalupe Mountain, Sonora; *Capt. E. K. Smith.* The segments of the calyx are much elongated after flowering, when they become almost subulate. One of the nutlets is sometimes larger and smoother than the others. Differs from E. crassisepalum in the longer, denser, and naked racemes; in the nutlets being wholly or nearly homomorphous, oblong, and only very minutely scabrous.

ERITRICHIUM CHORISIANUM, *DC. Prodr.* 10, *p.* 130? Grassy hills near San Luis Rey, and on mountains east of San Diego, California, March—June; *Parry.* The plant from the former station is much larger, with radical leaves 3 inches long and 3–4 lines wide. Specimens laid in the herbarium give out, after some time, a purplish material, which leaves the imprint of the plant on the paper. The coloring matter is of a resinous or terebinthine nature and is quite soluble in alcohol, so that it is not a kind of indigo. It is contained in cells which are situated along the margin and on each side of the midrib. In the dried plant the color is of a bright red. We have a strong suspicion that E. Californicum, E. Chorisianum, and E. Scouleri are not distinct.

PECTOCARYA CHILENSIS, *DC. Prodr.* 10, *p.* 120. California, (the station not recorded, but probably near San Diego;) *Parry.*

KRYNITZKIA LEIOCARPA, *Fisch. & Mey. Ind.* 7, *Sem. H. Petrop.* 1841, *p.* 52. Grassy hills near San Luis Rey, February; *Parry*. Also found in California by the *Rev. A. Fitch*.

ECHINOSPERMUM DEFLEXUM, *Lehm. Asp. No* 93: Var. lobis calycinis oblongo-linearibus. Hills near the Copper Mines, New Mexico, August, fl. & fr.; *Bigelow*. This differs from my European specimens of this species in the narrower lobes of the calyx; but they are nearly as broad as those of E. secundum, *Kar. & Kir.*, which Alph. DC. refers to E. deflexum. In specimens of the latter from Altai, (collected as I think by Bunge,) the nutlets are somewhat heteromorphous, two opposite ones having rather a broad margin, which is pectinate with flat glochidiate prickles; the other two are smaller, with a much narrower margin and shorter prickles. Our plant has a biennial root. The stem more than 2 feet high. Lower leaves 2 inches long and 5–7 lines wide, villous with spreading hairs. Racemes numerous, forming a loose terminal panicle, bracteate to the summit. Pedicels closely deflexed. Corolla salver-form, 2 lines long, with a short tube and obtusely 5-lobed border; the throat furnished with 5 very prominent tubercles. Nutlets homomorphous; the aculei marginal only, in a single series, confluent at the base.

ECHINOSPERMUM PATULUM, *Lehm. Asp. No.* 95. Gravelly and sandy soils. Valley of the Rio Grande, from El Paso to Eagle Pass, and west to the Gila. Usually about a foot high, and much resembling E. Lappula.

ECHINOSPERMUM STRICTUM, *Nees. in Maximill. Trav. App.; Torr. & Gray in Bot. Pope Rep. p.* 15. E. Texanum, *Scheele in Linnæa* 25, *p.* 260. Cynoglossum pilosum, *Nutt. Gen.* 1, *p.* 114? Near San Antonio, Texas; *Thurber*. Western Texas; *Wright*, No. 1573. Nutlets with an inflexed border and a deeply depressed disk; almost as in Omphalodes. Flowers pale blue.

ERITRICHIUM PTEROCARYUM, (n. sp.,) *Torr. in Bot. U. S. Expl. Exped. t.* 13, *ined.* Hills and rocky places near El Paso, etc.; *Bigelow*. (*Wright*, No. 1570.) This species was first detected in Oregon by Dr. Pickering while connected with the United States Exploring Expedition. It is about a foot high and remarkable for its conspicuously winged fruit, the wings being as broad as the body and more or less toothed above the middle. In the Oregon specimens, and in some of those from New Mexico, one of the nutlets is apterous.

CYNOGLOSSUM GRANDE, *Dougl.; Hook. Fl. Bor.-Amer.* 2, *p.* 85. Napa valley, California, March; *Thurber*. Also found by *Mr. Fitch* in the same State.

HYDROPHYLLACEÆ.

NEMOPHILA PEDUNCULATA, *Benth. in Linn. Trans.* 17, *p.* 275? Napa valley, California; *Thurber*. This is the same as No. 480 of Coulter's Californian Collection. It is named N. parviflora by Dr. Harvey, (MSS.,) but differs from that species in the seeds being more numerous (10–13) and tuberculate, not 4, and impressed-punctate. The arillus is calyptriform in both species. The leaves, too, are usually 7–9-lobed in N. pedunculata, and only 5-lobed in N. parviflora. Alph. De Candolle (in Prodr.,) remarks that he found the placentæ 2-ovulate in both species, and Fischer & Meyer (l. c.) think they are not distinct. They may have examined a different plant from the one here noticed, probably a mere variety of N. parviflora.

NEMOPHILA AURITA, *Lindl. Bot. Reg. t.* 1601; *Alph. DC. Prodr.* 9, *p.* 290. San Diego, California; *Parry*. San Pasqual, in the same State, May; *Thurber*.

NEMOPHILA LINIFLORA, *Fisch. & Mey. Sert. Petrop. t.* 5. Dana's Ranch, and grassy plains below Los Angelos, March; *Parry*. Napa Valley, May; *Thurber*.

ELLISIA MEMBRANACEA, *Benth. in Trans. Linn. Soc.* 17, *p.* 274; *Alph. DC. l. c. p.* 292. Moist shady places, San Diego, California; *Parry.* Coulter's No. 470 is the same.

ELLISIA CHRYSANTHEMIFOLIA, *Benth. l. c.; Alph. DC. l. c.* Santa Barbara, California, and near Tucson, Sonora; *Parry.* Our specimens agree with Douglas' original ones, except that the flowers are more developed in the former than in the latter. The corolla is nearly twice as long as the calyx.

PHACELIA CIRCINATA, *Jacq. fil. Ecl.* 1, *p.* 135, *t.* 91, *& Alph. DC. Prodr.* 9, *p.* 298. Dry hills near Santa Barbara and Monterey, California, April—May; *Parry.*

PHACELIA INTEGRIFOLIA, *Torr. in Ann. Lyc. New York*, 2, *p.* 222, *t.* 3. Near El Paso, etc., March—April, and Chihuahua, August; *Thurber.* (No. 1581, *Wright.*) The specimens from these stations resemble the original plant; but others, from the Mimbres and Sonora, have the leaves more or less deeply pinnatifid and the segments often toothed, (as in No. 1579, *Wright,*) so that the specific name is not appropriate. The capsule is globose. The four seeds are oval, rough, with minute warts on the back, and the face is strongly corrugated transversely, as well as marked with a longitudinal ridge.

PHACELIA CONGESTA, *Hook. Bot. Mag. t.* 3452; *Alph. DC. l. c.* Rocky hills near Camp Bache, and near the Copper Mines, July—August; *Bigelow.* Near San Antonio, Texas, April—May; *Thurber.* Nos. 1574, and 1576, *Wright;* also, ? 1755, a dwarf form.

PHACELIA TANACETIFOLIA, *Benth. l. c.; Alph. DC. l. c.* Hills near Monterey, California, May; *Parry.* San Diego, May; *Thurber.* Var. TENUIFOLIA. P. tenuifolia, *Harv. MSS. Pl. Coult.* San Diego and other places in California, March; *Parry, Thurber.* This is surely only a slender leaved var. of P. tanacetifolia. Var. LATIFOLIA: foliis segmentis ovato-oblongis grosse dentatis. Mountains east of San Diego, June; *Parry.*

PHACELIA NEOMEXICANA (*Thurb. MSS.*): erecta, pilis patentibus pubescentia viscosa intermixtis; foliis pinnatisectis, segmentis valde inequalibus, utrinque 4–6 cum impari oblongis inciso-dentatis, lobis ovatis subdentatis acutiusculis; racemis spiciformibus densifloris corymbosis; floribus subsessilibus; lobis calycis oblongis; corolla calyce subduplolongiore campanulata, margine eroso-dentata; staminibus vix exsertis. Pine woods near the Copper Mines, New Mexico, August; *Thurber.* (No. 1577, *Wright.*) Stem 1–2 feet high, hispidly pilose and viscidly pubescent. Leaves 3–4 inches long, thin, the segments rather distant, about an inch long. Calyx not enlarged in fruit. Corolla about 3 lines in diameter, the appendages near the base with their free margins reflexed. Filaments smooth. Style hairy below. Capsule globose-ovate.

PHACELIA (EUTOCA) LOASÆFOLIA. EUTOCA LOASÆFOLIA, *Benth. l. c.* Monterey, California, May; *Parry.* Also found by Rev. Mr. Fitch, but the station not recorded. We strongly suspect this to be only P. malvæflora, *Cham. & Schlecht. in Linnæa*, 4, *p.* 494. The only discrepancy is the number of seeds said to occur in that species; but there may have been more ovules, only part of which ripened.

PHACELIA (EUTOCA) VISCIDA. Eutoca viscida, *Benth. in Bot. Reg. t.* 1808. Cosmanthus viscidus, *Alph. DC. Prodr.* 9, *p.* 296. Bushy places near Santa Barbara, California, March. "Flowers yellowish," *Parry.* Eutoca albiflora, *Nutt. Pl. Gamb.*, seems to be scarcely distinct from this species. Mr. Nuttall described from dried specimens, and was not sure that the flowers were white.

PHACELIA (EUTOCA) DOUGLASII. Eutoca Douglasii, *Benth. l. c.* Sand hills, Dana's Ranch, California, March; *Parry.* Sepals linear-spatulate. Stamens included, "dilated at the base,

where they are united to the appendages of the corolla;" *Thurber, MSS.* The corolla is pale purple, not "lutescens?" as Alph. DC. supposed it to be.

PHACELIA (EUTOCA) PARRYI (n. sp.): parce hispida, pilis longis patentibus pubescentia viscosa intermixtis; foliis ovatis grosse inequaliter serratis; racemis plurifloris foliis multo longioribus; pedicellis calyce fructifero 2–3-plo longioribus; lobis calycis anguste-linearibus corolla ampla campanulata duplo brevioribus; filamentis basi squamæ corollæ adnatis; placentis 20–25-ovulatis. Mountains east of San Diego, California, June; *Parry.* Stem 1–2 feet high, apparently erect. Leaves 1–1½ inch long, tapering at the base to a petiole which is 6 or 8 lines long. Racemes at first circinate, when in fruit nearly a foot long. Pedicels about an inch in length, spreading horizontally. Segments of the calyx a little dilated upward. Corolla two-thirds of an inch in diameter, purplish, the lobes rounded and entire. Stamens scarcely exserted; the filaments with a small truncate or bidentate adnate scale at the base. Capsule ovate, rather acute, containing about 40 oblong and scabrous seeds. As remarked in the Botany of Parkes' P. R. R. Report, this species seems almost intermediate between Phacelia (Eutoca) and Whitlavia. It has the corolla of the former, with the long pedicels and corolline scales of the latter.

PHACELIA (EUTOCA) INFUNDIBULIFORMIS (n. sp.): annua, erecta, hispida, pilis rigidis patentibus pubescentia nigra viscosa intermixtis; foliis pinnatifidis, segmentis 7–9 inciso-lobatis, lobis obtusis integris vel dentatis; racemis scorpioideis plerumque bifidis multifloris, floribus congestis brevipedicellatis; lobis calycinis spathulatis; corolla semiquinquefida, lobis integris, tubo infundibuliformi; placentis 10–12-ovulatis. Overhanging rock on a mountain near Lake Santa Maria, Chihuahua, April; *Bigelow, Wright.* Plant 6–8 inches high, somewhat branching from the base. Leaves 1–2 inches long in Bigelow's specimens, somewhat longer in Wright's. Spikes 30–40-flowered, when in fruit 2½–4 inches long; the flowers very closely approximated, on pedicels a line or more in length. Calyx hispid and glandularly pubescent, the segments unequal, about two-thirds the length of the corolla, linear-spatulate, obtuse. Corolla pale purple, 2½ lines long, the tube narrower and funnel-form; lobes rounded. Stamens included, with a pair of oblique folds near the base of each filament. Style 2-cleft about half its length, hairy at the base. Fructiferous calyx nearly the length of the obtuse capsule. Seeds about 20, oval, compressed, scabrous, with an elevated ridge on the face. This species is remarkable for its funnel-form corolla, in which character it resembles the section Conanthus of Eutoca (*Alph. DC. Prodr.*); but the habit of the plant is different from that of E. aretioides. Wright's specimens have a laxer habit, as well as larger and more membranaceous leaves than Bigelow's, probably from having grown in a shady place.

PHACELIA (EUTOCA) DOUGLASII. Eutoca Douglasii, *Benth. l. c.; Alph. DC. l. c.* Sand hills, Danas' Ranch, California, March; *Parry.*

PHACELIA MICRANTHA (n. sp.): annua, erecta, gracilis, parce glanduloso-pubescens; foliis pinnatifidis, segmentis 5–9 obovatis obtusis integris vel 1–2-dentatis; petiolis marginatis basi auriculatis; racemis simplicibus vel bifidis paucifloris; calyce pedicello subæquali, segmentis obovato-oblongis obtusissimis, corolla late campanulata calyce vix longiore campanulata; placentis 8–12-ovulatis; seminibus oblongo-cylindricis incurvis transverse valde rugosis. Stony hills, near El Paso, March; *Bigelow.* Santa Cruz, near Tubac, Sonora; *Parry.* (No. 1582, *Wright.*) Plant 4–8 inches high, moderately branching. Leaves about an inch in length contracted below to a narrowly winged petiole and then dilated and auriculate at the base. Flowers distant, 1½ line in diameter, the pedicels slender and a little spreading. Calyx somewhat enlarged in fruit. Corolla pale purple; the 10 appendages minute, transversely lunate.

Seeds often 20–24, with deep transverse rugæ so as to appear articulated. A very distinct species, which was found by Dr. Bigelow, in Whipple's Expedition, as far west as the Colorado of California, but was omitted in the Botanical Report.

PHACELIA CILIATA, *Benth. l. c.* Grassy hills, San Luis Rey, California, February; *Parry.* San Diego; *Thurber*, (a large state of the plant.) Hill sides, Sonora, March; *Capt. E. K. Smith.* Ojo de Vaca, Chihuahua; *Thurber.*

EMMENANTHE PENDULIFLORA, *Benth. l. c.; Alph. DC. l. c.* San Pasqual, California, May; *Thurber.* We have also specimens of this rare plant collected by Dr. Andrews, near Monterey.

POLEMONIACEÆ.

PHLOX DRUMMONDII, *Hook. Bot. Mag. t.* 3441; *Benth. in DC. Prodr.* 9, *p.* 305. Sandy places, central and western Texas, June to September.

PHLOX SPECIOSA, *Pursh, Fl.* 1, *p.* 149; *Benth. l. c. p.* 307. P. longifolia, *Torr. in Stansbury Rep.* Gravelly hills, on the upper Rio Grande.

Var.? STANSBURYI: suffruticosa; caule superne pedicellis calycibusque glandulosa-pubescentibus; corollæ lobis oblongo-cuneatis obtusis vel emarginatis. Gravelly hills near the Organ Mountains, New Mexico; *Bigelow.* San Luis Mountain; *Capt. E. K. Smith.* Plant about a span high, much branched from a ligneous base, hairy and glandular, or the leaves and lower part of the stem nearly smooth. Teeth of the calyx scarcely as long as the tube. Corolla rose-color, the segments often a little emarginate. Style two-thirds as long as the tube of the corolla. Cells of the ovary 2-ovuled.

PHLOX TRIOVULATA (*Thurber MSS.*): canescenti-pubescens; caule erecto suffruticoso e basi ramoso; foliis anguste linearibus rigidiusculis; calycis laciniis subulatis tubo subæqualibus; corollæ tubo calyce tertio longiore, laciniis obovatis margine sæpe eroso-denticulatis; stylo ovario subæquante; loculis ovarii triovulatis. Ravines, Mule Spring; *Thurber, Bigelow.* Rio Mimbres; *Dr. Henry.* Escondido; *Parry.* Flowers from April to July. (No. 504, 1653, 1654, *Wright.*) Plant 6–12 inches high, the lower part of the stem decidedly shrubby. Leaves 1–1½ inch long, and 1–1½ line wide. Corolla white, ¾–1¼ inch in diameter. The tube nearly straight; segments varying from nearly orbicular to obovate, sometimes with a short mucro. Style and its deep divisions scarcely as long as the ovary. Ovules superimposed. This is the only species of Phlox hitherto found in which there are more than two ovules in each cell.

COLLOMIA GRACILIS, *Dougl.; Benth. l. c. p.* 308. New Mexico, Sonora, and California, March—May.

COLLOMIA GRANDIFLORA, *Dougl. in Lindl. Bot. Reg. t.* 1174; *Benth. l. c. p.* 308. Mountains east of San Diego; *Parry.*

NAVARRETIA ATRACTYLOIDES, *Hook. & Arn. Bot. Beech. p.* 368; *Benth. l. c. p.* 310. Dry places near San Diego and Monterey, California; *Parry.* San Pasqual, May, *Thurber.*

NAVARRETIA SCHOTTII (n. sp.): humilis; foliis lineari-oblongis inciso-dentatis glabriusculis, dentibus paucis patentibus integris spinescentibus; capitulis paucifloris; corollæ tubo calyce sublongiore; staminibus exsertis; ovarii loculis 2-3-ovulatis. In the Colorado Desert, Sonora; *Schott.* Plant 2 or 3 inches high, simple below. Leaves about three-fourths of an inch long, with 5–6 salient teeth on each side; the involucral ones similar in form to the others. Flowers apparently white, sessile. Segments of the calyx subulate, terminating in a long slender spine, or rather bristle. Segments of the corolla oblong, acute, mucronate. The specimens were col-

lected very early in the season, and the more advanced state of the plant is doubtless considerably taller and more branching.

GILIA VIRGATA, *Steud. Nom.; Benth. l. c. p.* 311. Monterey, California; *Parry.* This species is certainly an annual.

GILIA GUNNISONI, *Torr. & Gray, in Pacif. Railroad Expl.* 2, (*Bot. Beckw. & Gunnis.*) *p.* 128, *t.* 9. Dry places along the upper Rio Grande and west to Sonora. (No. 1642; *Wright.*)

GILIA POLYCLADON (n. sp.): caulibus plurimis subpatulis puberulis inferne nudiusculis apice foliosis cymoso-capitatis; foliis oblongis hirsutis pinnatifido-incisis segmentis oblongis plerumque integris vel 1–2-dentatis; calycis dentibus spinuloso-acuminatis; corollæ tubo calyce subæquali, laciniis oblongis; loculis ovarii biovulatis. Stony hills near El Paso, March. Annual, stems 4–8 from one root, slender terete, somewhat spreading, simple and mostly naked, except at the summit, where they branch into a leafy cymose tuft. Leaves mostly radical, about an inch long, pinnately cut into 9–11 oblong spreading lobes, which are mostly simple. The leaves of the stem are similar to the radical, only they are smaller. Fructiferous calyx as long as the capsule. Corolla white, with a tinge of rose-color. Allied to G. inconspicua.

GILIA ACHILLÆFOLIA, *Benth. l. c.* 311. San Isabel, California, May; *Thurber.*

GILIA CAPITATA, *Dougl. in Bot. Mag. t.* 2698; *Benth. l. c.* Common in most parts of California, from Oregon to San Diego, usually not far from the coast.

GILIA MULTICAULIS, *Benth. l. c.* Near San Diego, March; *Parry.* Perhaps only a variety of the last.

GILIA TRICOLOR, *Benth. l. c.* Napa county, California; *Thurber.*

GILIA INCONSPICUA, *Dougl. in Bot. Mag. t.* 2883; *Benth. l. c.* Sandy and stony places, banks of rivers, from the Rio Grande, particularly near El Paso, westward along the Gila to California.

GILIA INCISA, *Benth. l. c. p.* 312. Central and western Texas to the Rio Grande, also in New Mexico, Chihuahua, and Neuvo Leon. Plant 12–18 inches high. It appears to be both annual and biennial. Flowers white. The radical leaves often form a cluster, and are much less cut than the stem leaves.

GILIA RIGIDULA, *Benth. l. c.* Hill sides and rocky ravines, western Texas, New Mexico, and Sonora, March—May. (No. 1645, *Wright.*) Perennial. Plant 4–10 inches high, branching from the base, viscidly pubescent or almost glabrous. Leaves mostly simply pinnatifid, with 5–7 distant rigid and pungent segments, which vary from oblong-lanceolate to very narrowly linear. The flowers are nearly three-fourths of an inch in diameter. Corolla bright blue, yellow in the throat. Cells of the ovary with several ovules.

GILIA MULTIFLORA, *Nutt. Pl. Gamb. in Journ. Acad. Phil.* (*n. ser.*) 1, *p.* 154. Hill sides near the Copper Mines, New Mexico, August; *Bigelow.* Sonora and Chihuahua, September; *Schott.* (Nos. 1646 and 1647, *Wright:* the latter with the tube of the corolla longer.) The stem rarely branches from near the root, except when the top has been injured.

GILIA AGGREGATA, *Spreng. Syst.* 1, *p.* 626. G. pulchella, *Dougl.; Hook. Fl. Bor.-Amer.* 2, *p.* 74. Cantua aggregata, *Pursh, Fl.* 1, *p.* 147. Ravines and rocky banks of the Rio Grande, particularly near the Cibolo river; also near the Copper Mines, July—September. (No. 1650 and 1651, *Wright.*) A very ornamental plant. We have restored the older specific name of Pursh.

GILIA LONGIFLORA, *G. Don, Gard. Dict.* 4, *p.* 245; *Benth. l. c.* Cantua longiflora, *Torr. in Ann. Lyc. N. York.* 2, *p.* 221 *& in Sitgr. Rep. p.* 165, *t.* 7. Common in western Texas, New

Mexico, Chihuahua and Sonora; flowering throughout the spring and summer. (No. 509, 1648 and 1649, *Wright.*)

GILIA DIANTHOIDES, *Endl. Atakt. t.* 29. Dry hills near San Diego, California, February; *Parry.* Coronados Islands, California, May; *Thurber.*

GILIA DICHOTOMA, *Benth. l. c.* Var. PARVIFLORA: floribus multo minoribus; corollis inexpansis. Cook's spring, and near Frontera, Texas, March—April; *Bigelow, Wright.* About 6 inches high. Leaves palmately 3-parted to the base; segments subulate and somewhat rigid. Corolla much smaller than in the Californian plant, and it does not seem to expand. In other respects I can find nothing to distinguish it. There are from 20 to 25 ovules in each cell of the ovary.

GILIA PHARNACEOIDES, *Benth. l. c.* Near the summit of the mountains east of San Diego, June; *Parry.*

GILIA AUREA, *Nutt. Pl. Gamb. l. c. p.* 155, *t.* 32. Copper Mines, New Mexico, April—May; *Parry.* Journado between Tucson and the Rio Gila, March; *Parry.* Ojo de Vaca, Chihuahua; *Thurber.*

GILIA LUTEA, *Steud. l. c.; Benth. l. c.; Bot. Mag. t.* 4735. Mountains east of San Diego, June; *Parry.*

GILIA ANDROSACEA, *Steud. l. c.; Benth. l. c.* Napa county, California, March; *Thurber.*

GILIA DENSIFLORA, *Benth. l. c.* Grassy places near Monterey, California; *Parry.* Not sufficiently distinct from G. grandiflora.

GILIA CALIFORNICA, *Benth. l. c.* Leptodactylon Californicum, *Hook & Arn. Bot. Beech. p.* 369, *t.* 89. Near Santa Barbara, California; *Parry.* This species is decidedly shrubby. Dr. Antisell found it growing at Santa Inez, 3–5 feet high.

POLEMONIUM CŒRULEUM, *Linn.; Hook. Fl. Bor.-Amer.* 2, *p.* 71. Banks of the Mimbres, New Mexico, October, (in fruit); *Bigelow.* Stem 3 feet high, and, as well as the leaves glabrous. Segments of the leaves 17–21, lanceolate, acute, about an inch long. We find among our numerous specimens of this polymorphous species, some that accord very well with our New Mexican plant.

LŒSELIA GLANDULOSA, *G. Don, l. c. p.* 248. Hill sides near Mt. Carmel, Chihuahua; *Dr. Parry.* Neuvo Leon; *Dr. Edwards.* Dr. Gregg found it near Saltillo, Coahuila.

NAMA DICHOTOMA, *Choisy, Desc. Hydrol. p.* 19; *& in DC. Prodr.* 10, *p.* 182. Sandy prairies and along water courses, western Texas and New Mexico from Doña Ana to the Gulf, and westward throughout the Mexican States to Sonora and California. (No. 495, 1585 and 1586, *Wright.*) Very much branched, spreading or assurgent. Flowers pale purple, yellowish in the throat. Our plant resembles a Chilian specimen of N. dichotoma received from Dr. Arnott (which is part flowering), but differs from the description of Choisy in the corolla being half as long again as the calyx.

Var. PARVIFOLIA: caule tenui laxiuscule ramoso; foliis (semiuncialibus) obovatis obtusis basi in petiolum brevem attenuatis; floribus solitariis geminisque, pedicellis calyce dimidio longioribus. Santa Rosa, Chihuahua, January; *Bigelow.* Monterey, Neuvo Leon; *Dr. Edwards and Major Eaton.* Annual. Stem very slender, dichotomously branching, purplish. Lower leaves about half an inch long, abruptly narrowed at the base into a petiole which is less than half the lamina; upper leaves 3–5 lines long. Flowers nearly as in the larger variety.

NAMA JAMAICENSIS, *Linn. Sp. p.* 327; *Choisy, l. c.* San Antonio, Texas; *Thurber.* Sonora and Chihuahua; *Schott, Parry.* It is No. 316 of Drummond's 2nd Texan Collection.

ERIODYCTION CALIFORNICUM, *Benth. Bot. Sulph. p.* 35; *Choisy in DC. Prodr.* 10, *p.* 185. Wigandia Californica, *Hook. & Arn. Bot. Beech. p.* 364, *t.* 88. Borders of the Lower Gila and on the mountains east of San Diego, California; *Major Emory.* Near Monterey and in other parts of California; *Parry.* A shrubby plant, commonly 3–5 feet high. The leaves are variable in breadth and toothing: one of the narrow-leaved forms being E. angustifolium, *Nutt.* The flowers are rather showy and of a light purplish-blue color.. The plant has a strong terebinthine taste, and abounds in a resinous matter which sometimes exudes so copiously from the stalks and leaves that in drying, the specimens stick firmly to each other and to the paper. The natives of California make an infusion of the leaves and use it as a tonic.

ERIODYCTION TOMENTOSUM, *Benth. l. c.* E. crassifolium, *Benth. l. c.* Sandy fields around San Diego, June; *Parry, Thurber.* This is a taller species than the preceding, growing from 6–8, and sometimes even 10 feet high. Like that, it is variable in the form and toothing of the leaves, and we have no hesitation in uniting the two species of Bentham here quoted. We have specimens that are intermediate, and Dr. Parry informs me, that he has seen them in California passing into each other.

FOUQUIERIACEÆ.

FOUQUIERIA SPLENDENS, *Engelm. in Wisliz. N. Mex. p.* 98; *Gray, Pl. Wright.* 1, *p.* 85, & 2, *p.* 63. Gravelly hills on the Rio Grande, from El Paso to the great cañon 60 miles below, April—May.

CONVOLVULACEÆ.

CONVOLVULUS LOBATUS, *Engelm. & Gray, Pl. Lindh. p.* 44. C. hastatus, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 194, *non Thurb.* C. Nuttallii, *Torr. in Emory's Rep. p.* 149. Hillsides and ravines; common in western Texas and New Mexico, along the Rio Grande; flowering through the season. Cañon of Guadalupe, Sonora; *Capt. E. K. Smith.* Near the next species.

CONVOLVULUS HERMANNIÆ, *Herit.; Choisy, l. c.* River banks and ravines; Presidio Falls, Rio Grande to Eagle Pass, March—November; *Schott, Bigelow.*

CONVOLVULUS CALIFORNICUS, *Choisy in DC. Prodr.* 9, *p.* 405. Hillsides near Monterey, California, May; *Parry.*

QUAMOCLIT COCCINEA, *Moench; Choisy, l. c. p.* 335. Magdalena in Sonora, *Thurber.* Copper Mines, August, (fl & fruit); *Bigelow.* (*Wright*, No. 1611.) The leaves in Dr. Bigelow's specimens are deeply 3-parted; the lateral divisions more or less angularly lobed at the base.

CALYSTEGIA SEPIUM, *R. Br. Prodr. p.* 483; *Choisy, l. c. p.* 433. Near San Diego, California, May; *Thurber.* C. Maximiliana, *Nees, in Maximil. Trav.* seems to be only a variety of this species.

CALYSTEGIA SOLDANELLA, *R. Br. Prodr. p.* 483; *Choisy, l. c.* Seabeach, Monterey and other places along the coast of California.

BATATUS LITTORALIS, *Choisy in DC. Prodr.* 9, *p.* 337. Convolvulus obtusilobus, *Michx. Fl.* 1, *p.* 139. Mouth of the Rio Grande and coast of the Gulf of Mexico, May; *Schott.*

IPOMŒA PANDURATA, *Mey.; Choisy, l. c. p.* 381. Wet places, near running water; western Texas, Oct.; (fl. & fr.); *Bigelow.* Leaves all entire and heart-shaped. Sepals varying from oblong to ovate, and from very obtuse to rather acute and mucronate.

IPOMŒA TENUILOBA (n. sp.): glabra; caule volubili; foliis petiolatis pedatis lobis 5–7 filiformibus integris; pedunculis unifloris petiolo subæqualibus; sepalis oblongo-lanceolatis acutis,

corolla (2½ unciali) tubulosa, brevi-5-loba; capsula globosa glabra. Hills and rocky places near Puerto de Paysano, western Texas, September; *Bigelow.* (No. 1617, *Wright*, is a variety with the segments of the leaves broader.) Stem several feet long, twining around other plants. Segments of the leaves 1–2 inches long, usually not more than half a line wide. Peduncle with 2 subulate bracteoles at the summit, thick and mostly recurved; the pedicel about the length of the peduncle. Tube of the corolla trumpet-shaped, more than two inches long; the limb rose color.

IPOMŒA HETEROPHYLLA, *Orteg.* Pharbitis heterophylla, *Chois. in DC. Prodr.* 9, *p.* 344. Rocky hills and prairies along the Rio Grande; also on the Rio Limpio and Devil's river. (Nos. 508, 509, a very hairy form, and 1613, *Wright.*) Sepals an inch long. Corolla more than three inches long, pale rose color.

IPOMŒA NIL, *Roth.* Pharbitis Nil, *Chois. l. c.* Western Texas; *Wright*, Nos. 1037 and 1612. Magdalena, Sonora, October; *Thurber.*

IPOMŒA LONGIFOLIA, *Benth. Pl. Hartw. p.* 16 & 345. I. Shumardiana, *Torr. in Bot. Marcy's Rep. p.* 291. Santa Cruz valley, Sonora, July; *Thurber.* "The prostrate branches are 6–10 feet long, forming large patches which are very conspicuous in the prairies. Flowers opening in the morning, white with a purple throat," (*Thurber,*) limb nearly three inches in diameter. This differs from Captain Marcy's plant in the larger flowers, but not in other respects. After comparison with an original specimen of I. longifolia, I think it must be united with that species.

IPOMŒA PES-CAPRÆ, *Sweet; Choisy, l. c. p.* 349. I. orbicularis, *Ell. Sk.* 1, *p.* 257. Sandy shores, Brazos Santiago, Texas, May; *Schott.*

IPOMŒA COMMUTATA, *Roem. & Sch. Syst.* 4, *p.* 228. I. trichocarpa, *Ell. Sk.* 1, *p.* 258? In cultivated grounds. Rancho San Christobel, lower Rio Grande, May; *Schott.* Our specimens agree with Berlandier's No. 1931, quoted by Choisy. The species seems to be perennial. The capsule is smooth.

IPOMŒA SINUATA, *Orteg.; Choisy, l. c. p.* 362. I. dissecta, *Pursh*, non *Willd.* Convolvulus dissectus, *Linn.; Michx. Fl.* 1, *p.* 139. In shady places along the Rio Grande, from the Presidio down to Eagle Pass; August—November. A widely spread species. We have it from Monterey, Mexico, collected by Dr. Edwards and Dr. Gregg. It occurs also in the West Indies and as far south as Brazil.

IPOMŒA LACUNOSA, *Linn.; Choisy, l. c. p.* 378. Alluvions of the Rio Grande, September, October.

IPOMŒA COSTELLATA (n. sp.): herbacea, glabriuscula, ramosa; foliis petiolatis pedatim 7–9-partitis, segmentis linearibus vel spathulato-linearibus integris ciliolatis; pedunculis 1–3-floris petiolum paullo superantibus; sepalis oblongis acutis exterioribus medio subcarinatis vel ruguloso-muricatis; corolla (semi pollicari) tubulosa brevilobata; capsula glabra. On the Rio Grande, from the mouth of Pecos to El Paso, and near the Copper Mines of New Mexico; July–October. (Nos. 505 and 1615, *Wright.*) Annual. Stems, 1–5 feet long, prostrate or climbing, slender. Leaves 1–1½ inch long, divided nearly to the base into 7–9 mostly very narrow lobes; petiole about as long as the limb. Pedicels thickened. Calyx glabrous, the exterior sepals more or less conspicuously carinate or even winged; the keel rugose-undulate, or sometimes muriculate. Corolla scarcely half an inch long, pink, the border with 5 short lobes. Style undivided; stigma capitate, two-lobed, and granulate. Capsule sub-globose, two-celled, the cells two-seeded. Seed hairy. This species is allied to I. Coptica.

IPOMŒA MURICATA (*Cav. Ic.* 5, *p.* 52, *t.* 478, *f.* 2, *ex Choisy, l. c. p.* 353): glabra; radice tuberosa globosa; caule prostrato; foliis subsessilibus palmatis, lobis 5–7 integris anguste linearibus vel lobo medio lineari-lanceolato; pedunculis unifloris brevibus (2–4 lin.); sepalis lanceolatis obtusiusculis, dorso muriculato; corolla tubulosa (unciali purpureo-coccinea) breviter 5-loba; capsula glabra. Sonora, Mexico; *Thurber*, September. (No. 1616, *Wright.*) Root a roundish tuber from half an inch to an inch or more in diameter. Stem a span long, slender. Leaves about an inch long, most of the segments scarcely half a line wide. Corolla almost trumpet-shaped.

IPOMŒA LEPTOTOMA (n. sp.): annua; caule prostrato (vix volubili) glabro; foliis petiolatis pedatis glabriusculis, lobis 5–7 linearibus ciliolatis integris, lobo medio elongato; pedunculis 1–2-floris petiolo multo longioribus; pedicellis calycibusque hispidulis; sepalis lanceolatis, apice attenuatis acutissimis; corolla campanulato-infundibuliformi (1½ unciali.) Near Santa Cruz valley, Sonora, September; *Thurber*. (No. 1614, *Wright.*) Stem branching from the root; the branches 1–1½ foot long, somewhat twining. Petioles 2–4 lines long. Leaves deeply divided in a pedate manner, the lobes scarcely a line wide, the middle lobe usually almost twice the length of the lateral ones; uppermost leaves often entire. Peduncle 1–2 inches long; the pedicels scarcely half an inch. Sepals about 4 lines long. Corolla with a bright reddish purple limb and a pale tube.

IPOMŒA FASTIGIATA, *Sweet?; Choisy, l. c. p.* 380? On the banks and in the bed of the San Pedro, Western Texas; September, (fl. & fr.); *Bigelow*. Seems to differ in the sepals being only mucronate and scarcely aristate.

EVOLVULUS ALSINOIDES, *Linn. Sp.* 392; *Choisy, l. c. p.* 447. Rocky hills, near Camp Bache, July; *Bigelow*. Corallitas, Chihuahua, *Aug.;* and Sonora, Mexico; *Thurber*. No. 1619, *Wright*, is a form with narrow leaves.

Var. HIRTICAULIS: caule hirsuto, pilis longis patentibus; foliis ovato-oblongis, obtusiusculis. Brazos, San Jago, Texas, and on the Rio Grande near the San Pedro river, May—September; *Schott*. Western Texas, *Wright*. Monterey, Mexico; *Dr. Edwards*.

Var. ANGUSTIFOLIA: caule hirsuto, pilis sparsis longis patentibus; foliis lineari-lanceolatis, acutis. Near the Great Cañon of the Rio Grande, August; *Parry*.

EVOLVULUS? OVALIFOLIUS (n. sp.): undique velutino-sericeis; caule prostrato e basi ramosissimo; foliis ovatis (pollicaribus 6–8 lin. latis) obtusiusculis crassiusculis, basi rotundatis vel subcordatis; floribus solitariis axillaribus brevissime pedicellatis; sepalis late ovatis mucronatis; capsulis monospermis. On the Rio Grande, below San Carlos, October; *Parry*. The specimens are in fruit only.

EVOLVULUS HOLOSERICEUS β OBTUSATUS, *Chois. l. c.* E. sericeus, *Nutt. Gen.* 1, *p.* 174, *non Swartz.* E. discolor, *Benth. Pl. Hartw. p.* 6. Rio Grande, near the San Pedro river, and near Yorktown, October; *Schott*. A more densely cespitose form, with shorter branches, occurs near the Copper Mines, June; *Bigelow*. Monterey, Neuvo Leon; *Dr. Edwards*. Cerralbo; *Gregg*. The pubescence, as in the next species, is reddish, at least in dried specimens; the peduncles are only one-flowered; the sepals are scarcely two lines long, and the leaves are often more than an inch in length. It may prove to be a distinct species. The peduncles of the early flowers are sometimes nearly as long as the leaves.

EVOLVULUS ARGENTEUS, *Pursh, Fl.* 1, *p.* 187; *Choisy, l. c.* E. pilosus, *Nutt. Gen.* 1, *p.* 174, *& in Trans. Amer. Phil. Soc. n. ser.* 5, *p.* 195, non *Lamarck*. E. Nuttallianus, *R. & Schult.* Gravelly hills, near Rock Creek and Van Horne's Wells, June—July; *Bigelow, Wright*. Copper Mines, N. Mexico; *Thurber*. Chihuahua; *Gregg*. It is No. 668 of Fendler's N. Mexico

Coll. A common species on the upper Arkansas. The specific name of Pursh is inappropriate, for the hairyness is rusty-colored, and not silvery. Perhaps E. holocericeus is not distinct.

DICHONDRA REPENS, *Forst. Gen. p.* 39, *t.* 20; *Choisy, l. c. p.* 451. Var. CAROLINENSIS, *Choisy, l. c.* D. Carolinensis, *Michx. Fl.* 1, *p.* 36. Rock Creek and Copper Mines, May—July; *Bigelow.* Santa Cruz Mountains, Sonora; *Thurber.* The leaves are commonly larger than in the plant of the southeastern States.

DICHONDRA ARGENTEA, *Willd. Enum. Hort. Ber. p.* 297; *Choisy, l. c.* Rocky hills on the Rio Grande, below El Paso, June—August; *Parry, Bigelow.* Chihuahua; *Thurber.* (*Wright*, No. 1621.)

CRESSA CRETICA, *Linn.* Var. TRUXILLENSIS, *Choisy, l. c. p.* 440. C. Truxillensis, *H. B. K. Nov. Gen. & Sp.* 3, *p.* 119. Low and sandy places. Laguna de Lache, Solado, Mexico, April; *Bigelow.* On the Gila, Sonora, June; *Thurber.* (No. 1618, *Wright.*) Saline soils, San Diego, California; *Parry.* Bolson de Mapini, Mexico; *Gregg.* Differs from our European specimens of C. Cretica, in being more upright, with considerably larger leaves and flowers, and in the linear-oblong (not roundish-ovate) anthers. The fruit, too, is mostly one-seeded. Still we follow Choisy, in regarding it as but a variety C. Cretica.

CUSCUTA. Dr. Engelmann, of St. Louis, has long been occupied in preparing a monograph of this genus, which will be published on his return from Europe. Although I have his determinations of a large proportion of the species collected in the Mexican Boundary Survey, I think it better to wait until his monograph appears, and thus to have the advantages of his latest researches, rather than publish my own observations on this difficult genus.

SOLANACEAE.

SOLANUM JAMESII, *Torr. in Ann. Lyc. N. York*, 2, *p.* 227. *Gray, in Sill. Jour. n. ser.* 22, *p.* 284; On the upper Rio Grande; west to the Copper Mines of New Mexico and the Zuni Mountains. Rocky places, Puerto de Paysano. Tuber about the size of a marble. The specimens collected by Dr. James, in Long's Expedition, were imperfect and erroneously described as annual.

SOLANUM FENDLERI, *Gray, l. c.* Near the Copper Mines, New Mexico; *Bigelow.* Near S. tuberosum, but differs in the segments of the leaves being nearly uniform in size; usually the lowest pair only being very small. The tubers, in the wild plant, are seldom more than half an inch in diameter.

SOLANUM TRIFLORUM, *Nutt. Gen.* 1, *p.* 128. On the upper Rio Grande. (No. 675 Fendl. Pl. N. Mex.) This is more common on the tributaries of the Red, Arkansas, and Missouri rivers.

SOLANUM NODIFLORUM, *Jacq. Ic. Rar.* 2, *t.* 326, *ex Dunal in DC. Prodr.* 13, *pars* 1, *p.* 46. Western Texas and on the Rio Grande from the mouth of the Limpio downward, June—July. (No. 524, 892 and 1904, *Berlandier.*) Perhaps only a variety of S. nigrum; and S. crenato-dentatum, *Dunal, l. c.* (at least the plant of Berlandier) is probably only another form of the same species.

SOLANUM DOUGLASII, *Dunal, l. c.* Moist places, San Luis Rey, California; *Parry.* Plant 8–10 feet high; flowers bright blue. Dr. Parry says that the stem is somewhat woody at the base, and that the berries are eaten by children; but it has very much the appearance of the last species.

SOLANUM UMBELLIFERUM, *Esch. in Mem. St. Petersb.* 10, *p.* 280; *Torr. in Whipp. Rep. p.* 127. S. Californicum, *Dunal, l. c. p.* 86. S. genistoides, *Dunal, l. c. p.* 85. S. Menziesii, *Dunal, l. c. p.* 159. In California; *Parry.* In most parts of California; but more common near the

sea. It is extremely variable in the form and size of the leaves, as well as in the degree of pubescence. Being a hardy, suffruticose species, and bearing a profusion of handsome blue flowers throughout the season, it deserves a place in our gardens.

SOLANUM LINDHEIMERIANUM, *Scheele in Linnæa*, 21, *p.* 766. S. triquetrum, *B. Dunal, l. c. p.* 154. Sandy and shady places, central and western Texas, and along the Rio Grande, from the mouth of the Pecos, downward; flowering throughout the season. (No. 1591 and No. 536, the latter a narrow-leaved form, *Wright;* No. 481, *Lindheimer;* No. 154 and 1416, *Berlandier.*) Variable in the size and breadth of the leaves, as well as in the length of the auricles. This is, perhaps, too near S. triquetrum. Dr. Engelmann formerly distributed the plant under the manuscript name of S. dulcamaroides, but he published no description of it.

SOLANUM ELÆAGNIFOLIUM, *Cav. Ic. t.* 243; *Dunal, l. c. p.* 290. S. flavidum, *Torr. in Ann. Lyc. N. York*, 2, *p.* 227. S. Texense, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 19. S. Roemerianum, *Scheele in Linnæa.* 21, *p.* 767. S. Hindsianum, *Benth. Bot. Sulph. p.* 39? Texas and New Mexico, especially along the Rio Grande and westward to California. (No. 1590, *Wright.* No. 659, 665 and 2069, *Berlandier.*) S. Texense differs only in being destitute of prickles; but intermediate forms are common. Dr. Gregg, who found this plant in all the Mexican States that he visited, remarks, in his notes, that the natives, who call the plant *Trompillo*, use the fruit for curdling milk, and likewise as a sudorific and sternutatory.

SOLANUM ROSTRATUM, *Dunal, Solan. p.* 234, *& in DC. Prodr. l. c.* S. heterandrum, *Pursh, Fl.* 2, *p.* 731, *t.* 7. S. Bejariense, *Moricand; Dunal, l. c.* Androcera lobata, *Nutt. Gen.* 1, *p.* 129. Nycterium lobatum, *Sweet.* N. luteum, *Donn; Torr. l. c.* Common in Texas and New Mexico, extending westward through the neighboring Mexican States. Perhaps not distinct from S. cornutum.

SOLANUM CITRULLIFOLIUM, *A. Braun in Ind. Sem. H. Frib.* 1849, fide *A. DC. Prodr.* 13, *pars* 1, *p.* 682. S. heterodoxum, *Jacq. Ecl. Pl. Rar.* 2, *t.* 103. Plains near Puerto de Paysano and near the Limpio; July—September; *Bigelow.* Flowers large, violet, an inch in diameter. The last three species belong to a remarkable group (Cryptocarpum, *Dunal,*) which Nuttall regarded as a proper genus, (Androcera.) It is chiefly distinguished by the fruit being completely inclosed in enlarged tube of the calyx.

SOLANUM HETERODOXUM, *Dunal, l. c. p.* 331? On the Rio Grande, below Presido del Norte; August; *Parry.* Corallitas, Chihuahua; *Thurber.* Differs from the last in the excessively hispid stem and branches, and in the much smaller flowers.

SOLANUM VERBASCIFOLIUM, *Linn. Sp. p.* 263; *Dunal, l. c. p.* 114. Near Monterey, Neuvo Leon; *Dr Edwards, Dr. Gregg.* Between Victoria and Tamaulipas; *Berlandier,* No. 806. A tall, suffruticose species; common in the warmer parts of America and Asia. Dr. Gregg says that the Mexicans call it *Yerba de San Pedro*, and that they use the plant made into a poultice as an application to ulcers and boils.

CAPSICUM MICROPHYLLUM, *Dunal, l. c. p.* 421. Western Mexico, Chihuahua, Neuvo Leon, etc.; common. It is used, like other red peppers, by the Mexicans, who call it *Chipatane.* The specific name is not appropriate.

PHYSALIS LOBATA, *Torr. in Ann. Lyc. N. York*, 2, *p.* 226. Solanum luteiflorum, *Dunal, l. c. p.* 64. Borders of the Rio Grande, from New Mexico to Eagle Pass, March—October. (No. 1595, *Wright.*) Dr. James collected this plant only in the early state, without fruit, except a single fructiferous calyx. We have, however, from the valley of the Rio Grande, numerous specimens of what is clearly the same species in a mature state, and which is the same as No.

1604 of Wright's Collection. The stem is 12–18 inches long, prostrate, and much branched. The leaves vary from coarsely sinuate-toothed to nearly entire. Flowers solitary, on pedicels which are much longer than the petioles. Corolla campanulate-rotate, purple, half an inch or more in diameter. Fructiferous calyx nearly as broad as long and much larger than the berry. Seeds irregular in outline, less compressed, and thicker on the edge than is usual in this genus; the testa cellular and spongy.

PHYSALIS PUMILA, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 193; Var.? SONORÆ: glabra, foliis lanceolatis integris. Fronteras, Sonora; June, *Thurber*. About a foot high, apparently erect, branching towards the summit Leaves solitary, 2–3 inches long, and 5–7 lines wide, attenuated at the base into a petiole. Flowers solitary, on pedicels which are shorter than the petioles. Segments of the calyx as long as the tube, triangular-lanceolate, acute. Corolla campanulate, yellowish, immaculate.

PHYSALIS LANCEOLATA; *Michx.* Var.? SPATHULÆFOLIA: prostrata dichotome ramosa minute pubescens; foliis spathulatis vel oblongo-spathulatis obtusis basi attenuatis solitariis vel geminis; pedunculis solitariis petiolo sublongioribus erectis; calycibus campanulatis dentibus tubo duplo brevioribus; corolla rotato-campanulata purpureo-maculata. On the sea beach near the mouth of the Rio Grande, May; *Schott*. We have a viscidly stellate-pubescent form, collected by Drummond in southern Texas, probably on the shore of the Gulf.

PHYSALIS LONGIFOLIA, *Nutt. l. c.?*; *Dunal, l. c.* Alluvions of the Rio Grande, 35 miles below San Elceario, and near the Copper Mines, June—July; *Bigelow*. Lower Rio Grande; *Schott*. We have also specimens collected by Lieut. Abert, on the upper Canadian, in 1846. Our plant differs from the descriptions given by Nuttall and Dunal in scarcely any respect except the narrower leaves. We have, however, only the upper part of the plant, on which the leaves (including the petiole) are rather oblong-lanceolate than ovate-lanceolate. Some of them are about 4 inches long. The root, according to Nuttall, is perennial.

PHYSALIS ALKEKENGI β DIGITALIFOLIA, *Dunal, l. c. p.* 438. Along the Rio Mimbres, New Mexico, May; *Thurber*. Near the Copper Mines; *Bigelow*. Sierra del Pajarito, Sonora; *Schott*. Probably, as Dunal suspects, a distinct species.

PHYSALIS MOLLIS, *Nutt. l. c.* Western Texas, and near the Copper Mines; *Thurber*. Nos. 1599 and 1600, *Wright*, seem to be only forms of this species; and 1597 a smoother form of the same. We have also specimens collected near Monterey. Flowers dull yellow, with dark purple spots at the base. It is near the preceding species.

PHYSALIS CARDIOPHYLLA (n. sp): perennis; caule petiolisque minute puberulis; foliis plerumque solitariis late cordatis grosse sinuato-dentatis longe petiolatis glabriusculis utrinque viridibus; pedicellis petiolo longioribus; calyce campanulato, dentibus tubo dimidio brevioribus; corolla (lutea) infundibuliformi-rotata immaculata. Sonora, and California, desert of the Colorado; flowers throughout the season; *Schott*. Stem 12–18 inches long, branching from the root, ascending or prostrate. Leaves ¾–1½ inch long, and nearly as broad as long, slightly succulent, sometimes nearly entire; the petiole about as long as the lamina. Pedicels mostly longer than the petioles. Calyx 2 lines long, the teeth triangular and acute. Corolla half an inch in diameter. Anthers equal, yellow. Fructiferous calyx ovate, an inch and a quarter long. Fruit the size of a small cherry. Seeds orbicular-reniform, much compressed, with a nearly even testa.

Several other species of this difficult genus are in the Mexican Boundary Collection, but they cannot at present be determined satisfactorily, either from the imperfection of the specimens, or for want of the means of comparison.

MARGARANTHUS SOLANACEUS, *Schlecht. Ind. Sem. Hort. Hal.* 1838, *p.* 8, *& Hort. Hal. p.* 1, *t.* 1; *Dunal, l. c. p.* 453. Santa Rita del Cobra, New Mexico, July—August; *Bigelow.* (No. 1603, *Wright.*) No. 1220 of Coulter's Mexican Collection. Our New Mexican specimens and those of Mr. Wright are considerably smaller than the plant represented by Schlechtendal, but his figure was taken from a cultivated specimen. Coulter's plant agrees exactly with the figure.

LYCIUM PALLIDUM, *Miers, Ill. S. Amer. Pl.* 2, *p.* 108, *t.* 67, *C.* Gravelly hills near the Rio Cibolo of the Rio Grande; also in Chihuahua and near the Copper Mines, New Mexico, April—July; *Bigelow.* (No. 760, *Fendler.*) It was also found by Frémont in 1844, on the Rio Virgen, a branch of the Colorado, western New Mexico. A shrub 3–4 feet high. Flowers greenish, larger than in any other North American species of this genus. It is remarkable for the loose campanulate calyx, the broad obtuse divisions of which are longer than the tube.

LYCIUM STOLIDUM, *Miers, l c. p.* 126, *t.* 71, *C.* On the Rio Grande, from the Presidio down to Laredo, May; *Schott.* (Nos. 540 and 1610, *Wright.*)

LYCIUM BARBINODE, *Miers, l. c. p.* 115, *t.* 68, *E.* On the upper Rio Grande and westward to the Rio Grande, March—April. A shrub about 5 feet high.

LYCIUM BERLANDIERI, *Dunal in DC. Prodr.* 13, *pars* 1, *p.* 521. Borders of the Rio Grande, from El Paso to Eagle Pass, March—April. Nos. 1604 and 1608, *Wright*, seem to be hardly distinct. A branching shrub 2–6 feet high. Flowers pale purple.

DATURA METELOIDES, *DC. MSS.; Dunal, l. c. p.* 544. Western Texas, Chihuahua, Sonora, and other Mexican States; common.* (No. 1606, *Wright.*)

* "This fine Datura, which has all the appearance of being indigenous in New Mexico and the adjacent provinces of Mexico, must be the D meteloides named by De Candolle, and described by Dunal in the Prodromus from one of the drawings by Mocino and Sesse. But the distinctions between it and D. Metel are not well stated; nor did Dunal himself identify the specie in the specimens from Berlandier's collection, No. 2156, gathered at Victoria, Tamaulipas, but referred them to D. Metel, and, in consequence, Alphonse De Candolle, in the *Geographie Botanique*, 2, p. 735, allows them to have considerable weight in favor of the American origin of D Metel. The only reason for doubting our New Mexican plant to be De Candolle's D. meteloides is, that Dunal described it as having a 'corolla 10-dentata,' which our plant has not. But the slight folds answering to the sinuses may have been exaggerated and misunderstood. From seeds gathered by Mr. Wright this species has been cultivated in the Cambridge Botanic Garden for several years, for the past two years by the side of Datura Metel. The leading diagnostic characters of the two may be expressed, as follows:

"D. METEL, *Linn:* viscidulo-pubescens; caule subvilloso; corollæ tubo ultra calycem sensim modice dilatato, limbo 10-dentata; basi calycis persistente subcapsula ampla.

"D. METELOIDES, *DC.:* pruinoso-glaucescens, vix puberula; flore suaveolente; corolla supra calycem cylindricum valde dilatata, limbo eximie 5-dentato; basi calycis subcapsula persistente angusta; foliis integerrimis.

"D. meteloides, although with us a lower plant than D. Metel, is more showy; its corollas (tinged with bluish purple) are more dilated-funnelform and larger, measuring 5 or 6 inches in diameter of the limb, and often 8 inches in length; and what may be called the limb is on each side equal in length to the part of the tube which projects beyond the calyx. In D. Metel the throat is much narrower, and the limb proportionally smaller, say 4 or 4½ inches in diameter. In D. meteloides there are no teeth or projections whatever at the sinuses of the corolla, nor does the slight plaiting there give the appearance of teeth; but the five proper teeth are very salient, narrowly subulate, and half an inch in length. The capsule is nearly glabrous, and with shorter prickles than the cultivated D. Metel, but otherwise similar, as are the seeds; the persistent and reflexed base of the calyx, however, is much smaller. The herbage has somewhat of the disagreeable odor of D. Metel, but the flowers are sweet-scented." *A. Gray.*

DATURA THOMASII, *Torr. Bot. Pacific R. Road Rep.* 5, *p* 362. Borders of the Colorado, near Fort Yuma; *Schott.* Mr. Thurber collected at Coralitas in Chihuahua, a Datura resembling this species, but with the capsule armed with only a few (about 20) very long and rigid slightly pubescent prickles. Both may be extreme forms of D. Stramonium.

NICOTIANA PANDURATA, *Dunal, l. c. p.* 569. Alluvions of the lower Rio Grande, Western Texas, and in the Mexican States on the west. Not very distinct from N. Roemeriana, *Scheele.* No. 630 and 3000 Berlandier's Coll. (from Matamoras) we think should be referred here.

PETUNIA PARVIFLORA, *Juss. Ann. Mus.* 2, *p.* 216, *t.* 47; *Miers Ill. t.* 23, *Dunal in DC. Prodr.* 13, *pars* 1, *p.* 575. Leptophragma prostrata, *Benth. in Dunal, l. c. p.* 578. Salpiglossis prostrata, *Hook. & Arn. Bot. Beech. p.* 153. Borders of the Rio Grande, lower Rio Grande and in the Mexican States westward to California. (No. 539 and 1587, *Wright.* No. 215 and 1475, *Berlandier.*)

NIEREMBERGIA (LEPTOGLOSSIS) VISCOSA (n. sp.): viscoso-pubescens; foliis elliptis-oblongis acutiusculis basi angustatis, inferioribus longiuscule petiolatis; floribus subaxillaribus; pedicellis calyce infundibuliformi-campanulata subæqualibus; calycis laciniis oblongis acutis tubo dimidio brevioribus; tubo corollæ elongato gracili apice gibboso.—Rocky hills, mouth of the Pecos, and on Devil's river, western Texas; *Bigelow.* (No. 535, *Wright.*) Root often annual, but sometimes, apparently, perennial. Stem 6–10 inches high, usually branching from the root. Leaves 8–10 lines long and 2–4 lines wide. Pedicels often extra-axillary, shorter than the leaves. Calyx funnelform-campanulate, about four lines long. Corolla nearly an inch long, the very slender tube more than twice the length of the calyx, saccate and somewhat gibbous at the throat; limb purple, more than half an inch in diameter, rather unequally 5-lobed, the lobes roundish and entire. Stamens inserted in the saccate throat of the corolla and included, two of them with short curved filaments and large roundish 2-celled anthers, 2 others with straight filaments and much smaller 1-celled anthers, the 5 stamen a mere abortive filament. Ovary ovate acute; style elongated and filiform; stigma dilated and somewhat petaloid, 2-lobed at the base, truncate and 2-lipped at the summit. Capsule much smaller than the fructiferous calyx, roundish ovate. Seeds oblong, a little curved, strongly corrugated transversely and somewhat spirally. Embryo moderately curved.

WITHANIA ? SORDIDA, *Dunal, l. c., p.* 456. Western Texas from New Mexico to the lower Rio Grande; near Monterey, Neuvo Leon; *Dr. Edwards.* Balson de Mapini; *Gregg.* (Nos. 531, 532, 533, 1596, and 1598, the last a broad leaved form, *Wright.* No. 676, *Fendler*, N. Mex.) Perennial; villous pubescent, the pubescence partly glandular. Leaves 1–1½ inch long. Pedicels 6–10 lines long. Calyx broadly campanulate, villous; corrolla 6 lines in diameter, dull yellow. Fruit the size of a large pea.

WITHANIA? CORONOPUS. Solanum Coronopus, *Dun. in DC Prodr.* 13, *pars* 1 *p.* 84. Along the Rio Grande and its tributaries, from El Paso to Laredo, April—July. (Nos. 534, 1593, and 1594, *Wright.* Nos. 74 and 480, Coll. 1846, and 484, Coll. 1847–8, *Lindheim.* No. 675, *Fendl.*, N. Mex. Nos. 666 and 3023, *Berlandier*, No. 1252, *Coult. Mex.*) Root annual? Plant roughish with minute short and thick hairs, which are bifurcate at the summit. Leaves lanceolate, 1–1½ inch long, more or less deeply pinnatifid or merely toothed, the upper part often linear and entire. Flowers solitary, on slender pedicels which are at length reflexed. Corolla dull yellow, about 6 lines in diameter. Fruit globose, the size of a large pea, nearly white when mature, about two-thirds covered with the calyx. This plant is certainly a congener of the last, which we have followed Dunal in referring doubtfully to Withania. The calyx increases with the fruit,

but never encloses it, nor does it become inflated. The corolla is much more rotate than campanulate.

NIEREMBERGIA ANOMALA, *Miers in Hook. Lond. Jour. Bot.* 5, *p.* 175, *& Ill.* 1, *t.* 20; *Dunal, l. c. p.* 588, Leucanthea Roemeriana, *Scheele in Linnæa* 25, *p.* 250. Bouchetia erecta, *DC. MSS.; Dunal, l. c.* Western Texas; *Wright.* Near Monterey, Neuvo Leon; *Dr. Edwards.* (No. 345 Coll. III, Texas, *Drummond.*) This corresponds exactly with the figure of Miers, who states that the Texan plant differs in no respect from the South American N. anomala. Stamens sometimes only 4 and subdidynamous, or when 5 one of them smaller. Seeds roundish, reticulate.

BROWALLIA (LEPTOGLOSSIS) TEXANA (n. sp.): annua, vicoso-pubescens; caule e basi ramoso erecto; foliis alternis integerrimis basi in petiolum attenuatis; floribus extra-axillaribus ad apices ramorum laxe subcymosis; pedicellis calyce campanulato-tubuloso subinflato subæqualibus; corollæ tubo gracili apice subgibboso calyce triplo longiore, limbi laciniis orbicularis subæqualibus. Near the mouth of the Pecos, September—October; *Bigelow, Pope.* (No. 535, *Wright.*) Plant a span high, dull green; leaves about three-fourths of an inch long, rather acute. Pedicels 3–5 lines long. Calyx 5-cleft; the lobes ovate and acute. Corolla salver-form; the tube very slender, 8 lines long, gibbous at the summit; limb flat and somewhat oblique, 6 lines in diameter, purple. Stamens inserted in the throat of the corolla, didynamous. Capsule globose-ovate, scarcely one-third the length of the fructiferous calyx; the valves at length bifid at the summit. Seeds irregularly oblong, strongly rugous transversely. Embryo a little curved. This plant clearly belongs to Leptoglossis of Bentham, and is nearly related to L. Schwenkioides. We think the genus should be united to Browallia. We are also disposed to adopt the views of those botanists who would remove the tribe Salpiglossideæ from Scrophulariaceæ to Solanaceæ; but we are not prepared to go so far as to unite these plants and certain tribes of the latter family into an intermediate order. The limits of these orders can not yet be fixed with any degree of precision.

GENTIANACEÆ.

FRASERA SPECIOSA, *Dougl. MSS.*; *Hook. Fl. Bor.-Amer.* 2, *p.* 66, *t.* 153. Copper Mines, New Mexico, and near the Rio Mimbres, June; *Bigelow.* Capsules slightly compressed, contrary to the valves; 40–50-seeded.

FRASERA PARRYI (*Torr. in Pl. Whippl. p.* 126): caule erecto tereti glabro; foliis caulinis oppositis ternisve lanceolatis undulatis, floralibus (bracteis) ovatis pedicellis multo brevioribus; sepalis ovatis albo-marginatis; petalis ovato-lanceolatis sepala subæquantibus, fovea lunata solitaria, corona obsoleta. Mountains east of San Diego, California, on the eastern slope, June; *Parry.* No. 558, California, *Coulter.* Stem 2–3 feet high. Radical leaves clustered, the upper cauline ones mostly ternate, the whorls remote. Flowers numerous, in a terminal panicle nearly an inch in diameter. Petals greenish white, speckled with purplish linear dots; the pit or gland lunate, with the horns pointing upward, fringed with hairs around the margin. Corona a mere narrow, slightly ciliate border. Fruit not known. Nearly allied to F. Carolinensis, but that species has the leaves in 4s and 5s, a leafy panicle, linear lanceolate sepals, and roundish-oval entire glands.

ERYTHRÆA CHIRONIOIDES. Gyrandra chironioides, *Griseb. in DC. Prodr.* 9, *p.* 44. (TAB. XLII.) On the Rio Grande, from Doña Ana southward to San Elceario, and westward to the valley of the Gila. (No. 3191, *Berlandier.*) Our plant has usually broader leaves than those of Berlandier's specimens. Var. *β*: floribus lateralibus breviter pedicellatis; corollæ laciniis obtusis. E. Muhlenbergii, *Griseb. l. c.*, (quoad pl. Calif.) Dry soils around San Diego and in many other parts

of California. It begins to flower when scarcely an inch high, but at length, in good soil, attains the height of a foot or more. The flowers vary greatly in size, from less than an inch to an inch in diameter. They are of a bright rose color with a yellow centre. We refer here E. Muhlenbergii, *Benth. Pl. Hartw.*, apparently a mere dwarf, small-flowered state of the plant, which we have from several collectors. This species is known in California by the name of *Canchalagua*, a bitter tonic of considerable reputation; but E. tricantha is often confounded with it, and possesses similar virtues. The same name has long been applied to E. Chilensis. Gyrandra speciosa, *Benth. Bot. Sulph. p.* 127, *t.* 45, differs from this species chiefly in the shorter filaments, and in being more spreading. I have noticed at least in one species that the filaments increase in length after flowering, as do the tube of the corolla and the style. In authentic specimens of Berlandier, (whose plant is certainly annual, not as stated by Grisebach, perennial,) the stem is 4-angled, as in all the species of Erythræa. The genus Gyrandra seems to have no characters by which it can be distinguished from Erythræa. The segments of the calyx are somewhat carinate, but not winged as in some genuine Erythræa. The corolla is of the same form in both genera. The anthers of E. Centaurium, as well as of other species that I have examined, are as destitute of a connective as are those of Gyrandra.

Erythræa Texensis, *Griseb. Gent. p.* 139, *& in DC. Prodr. l. c., p.* 58. Rocky places on the Pecos; *Bigelow;* and along the Rio Grande; *Schott.* April—September.

Erythræa Beyrichii, *Torr. & Gray, Fl.* 2, *p.* —, (*ined.;*) *Torr. in Bot. Marcy's Rep. p.* 291, *t.* 13. E. tricantha, *β* angustifolia, *Griseb. in DC. l. c.* 60. Rocky banks of the Pecos and San Pedro; *Bigelow*, etc. Sabina creek, Texas; *Thurber.* (No. 1662, *Wright.*)

Erythræa tricantha, *Griseb. Gent. p.* 146, *and in DC. Prodr.* 9, *p.* 60; *Benth. Pl. Hartw. p.* 322. In various parts of California, especially near the coast. We have from Sir William Hooker specimens of this plant, collected by Douglas, which agree in all respects with ours. The lobes of the corolla are not "linear and very acute," but lanceolate and rather obtuse. Grisebach probably drew his description from specimens which were dried without pressure, so that the lobes of the corolla had become involute and apparently very narrow as well as acute. After a careful comparison of original specimens of E. tricantha and E. floribunda, (the California plant of *Benth. Pl. Hartweg,*) I have little doubt that they are forms of one species. E. floribunda differs only in the broader lobes of the corolla.

Gentiana detonsa, *Fries. Griseb. in DC. Prodr.* 9, *p.* 101; *Torr. Fl. N. York*, 2, *p.* 108, *t.* 82. Babacomori to Santa Cruz, in wet places, September; *Thurber.* (No. 1658, *Wright.*)

Gentiana affinis, *Griseb. in Hook. Fl. Bor.-Amer.* 2, *p.* 57. Hills and rocky places near the Copper Mines, August—October; *Bigelow.* (No. 1657, *Wright.*)

Gentiana quinqueflora, *Lam. Dict.* 2, *p.* 643; *Griseb. l. c.* Western Texas. No. 1659, *Wright.*

Eustoma Russelianum, *G. Don, Gen. Syst. Gard.* 4, *p.* 175; *Griseb. in DC. Prodr.* 9, *p.* 51. Valley of the Rio Grande, etc., in sandy soils; common, May—October; *Thurber.* On the Gila, Sonora; *Thurber.* (No. 1660, *Wright.*) Leaves varying from oblong and obtuse to narrowly lanceolate and acute. The flowers also vary greatly in size and in the proportionate length of the segments and tube of the corolla Perhaps not distinct from E. exaltatum.

Sabbatia campestris, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 197. Prairies on the Guadalupe river, Texas, May—June; *Wright.* (No. 2568, *Berlandier.*)

APOCYNACEÆ.

ECHITES MACROSIPHON (n. sp.): caule erecto suffruticoso; ramis tomentosis; foliis ovatis acutis vel acutiusculis brevissime petiolatis basi obtusis vel subcordatis supra pubescentibus subtus albo-tomentosis; pedunculo terminali uni-(raro bi-) floro petiolo subduplo longiore; lobis calycinis lineari-lanceolatis; corollæ puberulæ tubo calyce 6–8-ies longiore versus apicem ventricoso, lobis obovatis. (Tab. XLIII.) Hills and dry rocky places along the Rio Grande, in Texas and Chihuahua, August—September. (Nos. 556, 557, and 1664, *Wright*.) Plant 1–3 feet high, often a little branching at the summit. Leaves ¾–1½ inch long, and ½–1 inch wide, often obtuse, but usually with a short abrupt point, the petioles scarcely more than a line in length. Flowers of a spicy odor. Calyx with numerous (30–40) minute subulate glands on the inside surrounding the base of the corolla. Corolla white, tinged with rose externally; the tube 3–5 inches long, the upper part, for about an inch, 3 times the diameter of the lower portion, not constricted at the throat, pubescent inside below the insertion of the stamens. Nectary of 5 unequal obtuse compressed distinct glands, which are about half the length of the ovary. Follicles about 3 inches long, very slender and tapering to a long point. Seeds oblong-linear; testa wrinkled; the coma at each end longer than the body of the seed. Very much resembles E. hypoleuca, *Benth*; but that has longer peduncles, a velvety-pubescent corolla, the tube of which is only twice the length of the lobes and dilated about one-half its length as well as constricted at the orifice; also two of the glands of the nectary are connate.

ECHITES BRACHYSIPHON (n. sp.): caule erecto suffruticoso, ramis puberulis; foliis oblongis ovatisve acutis utrinque pubescentibus subconcoloribus brevi-petiolatis; pedunculis terminalibus unifloris petiolo 5-plo longioribus; lobis calycinis oblongis; corollæ tubo calyce 4-plo longiore supra medium subventricoso, lobis obovatis. Arroyo de los Janos and San Bernardino, Sonora; *Schott, Thurber*. (No. 1665, *Wright*.) Plant from a span to a foot high, more spreading than the preceding. Leaves about an inch long, sometimes smaller and oblong-lanceolate, the lower ones often obtuse, not white on the under side. Peduncles ¾ of an inch long. Calyx 2½ lines long, with about 20 minute subulate glands at the base. Corolla white; the tube an inch and a quarter long, the lower half much contracted. Nectary with two of the glands united into one. This species also is related to E. hypoleuca, but that differs in the under part of the leaves being clothed with a dense white tomentum, and the segments of the calyx are much narrower as well as longer.

APOCYNUM CANNABINUM, *Linn. Sp. p.* 311; *Alph. DC. Prodr.* 8, *p.* 439. Western Texas, Sonora, and California. Broad and narrow leaved forms occur in all these places.

AMSONIA TOMENTOSA, *Torr. & Frém. in Frém. 2d Rep. p.* 316. Sandy plains and ravines, borders of the Rio Grande, Chihuahua, Sonora, &c, April—May. Stems about a foot and a half high, several springing from a woody base. Leaves varying in breadth from linear to lanceolate, clothed with a short dense and more or less hoary pubescence. Flower about as large as in A. Tabernæmontana, *Walt*. Pods 2–3 inches long and 2 lines in diameter, cylindrical, erect. A variety, or perhaps distinct species, occurs at Laguna Santa Maria, Chihuahua. It is glabrous; the flowers are considerably smaller, with the sepals glabrous and nearly as long as the tube of the corolla. In A. tomentosa the sepals are hairy and scarcely half as long as the tube of the corolla. A Tabernæmontana differs in the very short lanceolate sepals, which are scarcely one-fourth the length of the tube of the corolla.

AMSONIA TABERNÆMONTANA, *Walt. Fl. Car. p.* 98; *Decaisne in DC. Prodr.* 8, *p.* 385. A. ciliata, *Walt. l. c.; Decaisne, l. c.* A. latifolia, *Michx. Fl.* 1, *p.* 121. A. angustifolia, *Michx. l. c.* A. salicifolia, *Pursh, Fl.* 1, *p.* 184. A. tristis, *J. E. Smith in Rees' Cycl.* Hills near the Blanco river, Texas; *Wright.* A nearly glabrous variety.

AMSONIA LONGIFLORA (n. sp.): glabra; caule erecto e basi lignoso ramosissimo; foliis linearilanceolatis vel linearibus; corollæ tubo gracili elongato (1½ unc. longo) superne subventricoso; sepalis lanceolato-subulatis. Rocky ravines near El Paso, April—May. (No. 1668, *Wright.*) Plant 1–2 feet high. Leaves 1½–2 inches long, and from less than a line to 2½ lines wide. Corolla blue; lobes of the limb about one-fourth the length of the tube. Pods as in the two preceding species. No. 1671 Wright is a variety with very narrow leaves, which are scabrous with short hairs on the margin.

HAPLOPHYTON CIMICIDUM, *Decaisne in DC. Prodr.* 8, *p.* 412? In crevices of rocks, Magdalena, Sonora; *Thurber, Schott.* (No. 1666, *Wright.*) Stems several from a woody base, 1–2 feet high, minutely pubescent. Leaves 1–1½ inch long, and 2½–4 lines wide, opposite or alternate, scabrous with short rigid hairs, which stand on a swollen crustaceous base. Flowers terminal solitary or 2–3 in a cymule. Calyx ⅔ the length of the corolla-tube; no traces of glands. Corolla sulphur-yellow, somewhat salverform; the tube shorter than the obovate lobes. Stamens united about middle of the tube of the corolla; anthers oblong, rather acute, rather longer than the free portion of the filaments. Ovaries oblong, distinct, each 7–8-ovuled; style rather stout. Stigma oblong-capitate, entire. Pods 2 inches long, very slender, tapering to a long narrow point. Seeds oblong-linear, the testa wrinkled, each extremity furnished with a coma of white hairs, which are longer than the body of the seed. This genus was founded on a Mexican plant; and part of the character, especially what relates to the seed, is drawn from an unpublished figure of Mocino and Sesse. Notwithstanding the seed is said to be hairy only at the upper extremity, I strongly suspect that the coma of the lower end had become detached, as it is very deciduous. Our plant agrees in every respect with H. cimicidum, except that the latter is said to have leaves 2–2½ inches long and 8–10 lines wide.

ASCLEPIADACEÆ.

METASTELMA BARBIGERUM, *Scheele in Linnæa*, 21, *p.* 760. Hill sides and thickets, borders of the Rio Grande, from New Mexico to Eagle Pass, June—September. Near Monterey, Neuvo Leon, *Dr. Edwards.* (No. 549 and 1676, *Wright.* No. 2172 and 3198, *Berlandier.*) Dr. Gregg collected it in Neuvo Leon, west of Cerralbo. We have what appears to be M. Schlechtendalii, *Dne*, collected in Key West, Florida, by the late Mr. Blodgett.

METASTELMA? ANGUSTIFOLIA (n. sp.): glabrata; caule prostrato vix volubili; foliis angustelinearibus acutis basi in petiolem brevem attenuatis; floribus plerumque solitariis axillaribus oppositis breve pedicellatis; corollæ laciniis lineari-lanceolatis acutissimis apice recurvis introrsum infra medium retrorsim pilosis; coronæ stam. foliolis oblongo-spathulatis erectis integris gynostegio constricto subæqualibus; stigmate longe rostrato.—Sides of ravines, Santa Cruz, Sonora; *Wright*, No. 1677. Stem 1–3 feet long, slender, with a somewhat ligneous base. Leaves 1–1½ inch long and one line wide. Flowers purplish, 2 lines long, on pedicels of the same length. Calyx deeply 5-parted, the segments narrowly lanceolate. Corolla subcampanulate, the long segments recurved above the middle. Horny margins of the anthers angularly projecting; the membranaceous summit elongated, erect, oblong. Stigma with a cylindrical

beak, which is somewhat longer than the erect anther-membrane. Pods not seen. We refer this plant to Metastelma with much doubt, but there is no other genus to which it seems to be more allied. It occurs also in Lindheimer's Texan Collection.

ROULINIA UNIFARIA, *Engelm. MSS.* Gonolobus unifarius, *Scheele in Linnæa*, 21, *p.* 760. Shady thickets, near the Rio Grande, western Texas and New Mexico, July—October; *Schott, Bigelow.* (Nos. 546 and 1672, *Wright.*) I fear that it is too near *R. Jacquini.*

ACERATES VIRIDIFLORA, *Ell. Sk.* 1, *p.* 317; *Decaisne in DC. Prodr.* 8, *p.* 522. Asclepias viridiflora, *Pursh, Fl.* 1, *p.* 181. Western Texas; *Bigelow.* No. 1693, *Wright*, is a variety with broadly obovate and emarginate leaves. In my Flora of the Northern and Middle States (2, *p.* 182) I incorrectly referred Asclepias obovata, *Ell.*, to this variety; a mistake which has been copied by Decaisne. Elliott's plant is a genuine Asclepias; but A. obtusifolia *β*, *Torr.*, also referred by Decaisne to A. obovata, is our A. Jamesii, described below.

ACERATES DECUMBENS, *Decaisne, l. c.* Anantherix decumbens, *Nutt. l. c. p.* 202. Valley of the upper Rio Grande and westward to the Gila river, April—August.

ACERATES AURICULATA (*Engelm. MSS.*): "caule erecto glabro; foliis sparsis linearibus filiformibus; umbellis pluribus axillaribus multiflorus breviter pedunculatis; pedicellis pilosis, calyce extus villoso; corollæ laciniis reflexis; cucullis gynostegio globoso sessili brevioribus apice leviter tridentatis margine involutis basi latissime biauriculatis; folliculis lanceolatis longe rostratis brevibus." Dry ravines near the Copper Mines, and along the Mimbres, June—July; *Bigelow.* Stem 2–3 feet high, somewhat glaucous. Leaves slightly scabrous on the margin, which is not revolute, 4–6 inches long, ½–¾ line (rarely as much as a line) wide. Pedicels 6 lines long. Lobes of the corolla 2½ lines long. Horny wings of the anthers rounded, not angular as in most Asclepiadeæ. Pollen-masses also, of an unusual shape, curved, nearly equally wide, and obtuse at each end: remarkable, also, for the large triangular wings at the sides of the hoods. Pods 3 or 4 inches long. Resembling A. angustifolia, but easily distinguished by the perfectly smooth stem and non-revolute leaves, but especially by the larger flower, the peculiar structure of the cuculli, and the shape of the pollen-masses. This is No. 706 of Fendler's New Mexican Collection, and No. 1687 of Wright's. It was found also by Frémont on the upper Arkansas. Doubtless it has often been confounded with A. angustifolia.

ACERATES (ANANTHERIX) TOMENTOSA (n. sp.): albo-lanata; caule erecto simplici; foliis ovatis acutis sessilibus basi rotundatis v. cordato-amplexicaulibus; umbellis sessilibus plurifloris; gynostegio sessili; cucullis suborbicularis saccatis apertis lateraliter compressis. (TAB. XLIV.) Mountains east of San Diego, California, June; *Parry.* San Isabel, in the same State; *Thurber.* We have also specimens collected by the Rev. Mr. Fitch, in some part of California. Stem 2–3 feet high. Lower leaves 4–5 inches long, and nearly 3 inches wide, usually clasping at the base. Umbels 3–4, in the axils of the upper leaves, 8–12-flowered; pedicels 1–1½ inch long, very densely clothed with white wool. Flowers a third larger than in Asclepias Cornuti, "of a chocolate-purple color." (*Parry.*) Petals ovate, reflexed, woolly externally. Hoods of the crown nearly orbicular, spreading, without any trace of a spur, the margin of the orifice entire and introflexed. The horny wings of the anthers almost rectangular at the base. Follicles oblong-lanceolate, downy. This is a remarkable species, belonging rather to the subgenus Anantherix than to Acerates proper.

SARCOSTEMMA BILOBUM, *Hook. & Arn. Bot. Beechey, p.* 317. S. cynanchoides, *Decaisne, l. c. p.* 540. S. Texanum, *Engelm. MSS.* Gonolobus cynanchoides, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 43. Borders of the Rio Grande, from Presidio del Norte to Eagle Pass, June—October;

Parry, Schott. Valley of the Limpia; *Bigelow.* Sonora; *Thurber.* (No. 1680, *Wright.* No. 904, 1951, and 2334, *Berlandier.*) This slender vine climbs trees to the height of 30 or 40 feet, or trails over shrubs and other plants. The flowers have an agreeable odor. I strongly suspect this to be the Gonolobus viridiflorus, *Nutt.* (not of *Roem. & Schult.*) It is certainly the plant so named in my account of the plants collected by Dr. James in Long's Expedition, and, I think it was so regarded by Mr. Nuttall, who cursorily examined those plants in my herbarium.

SARCOSTEMMA ELEGANS, *Decaisne, l. c. p.* 541? Rocky places, Presidio del Norte, July—August; *Parry.* Camp Bache, and on the Cibolo of the Rio Grande; *Bigelow.* Our plant accords with the description of Decaisne, but it may be a distinct species. It differs from the last in the strongly pubescent stem and leaves; the flowers twice as large, and the segments of the corolla oblong and obtuse, with a reticulate venation; whereas in S. cynanchoides the divisions of the corolla are ovate and acute, with several parallel longitudinal veins. The follicles are pubescent, about 4 inches long, half an inch wide in the middle, and tapering to a long point.

SARCOSTEMMA UNDULATUM (n. sp.): volubile, glabratum; foliis lineari-lanceolatis acutis basi subauriculato-cordatis margine undulato-crispatis; pedunculis petiolo 2–3-plo longioribus plurifloris; corona staminea exteriore pelviformi integerrima, interiore foliolis ovatis obtusis gynostegio brevioribus. Mountains east of the Rio Grande, 70 miles below El Paso, June; *Parry.* Copper Mines, New Mexico; *Bigelow.* (No. 1678, *Wright.*) Stem 2–3 feet long, twining, or sometimes prostrate. Leaves 2–4 inches long, and 5–8 lines wide in the middle; tapering to a long point, usually dilated and auriculate-cordate or somewhat hastate at the base; the mid-rib often whitish on both surfaces; the margin more or less undulate or crisped; petioles about half an inch long. Umbel 8–10-flowered. Peduncles 1–1½ inch long, and the pedicels about the same length. Flowers half an inch in diameter. Segments of the calyx linear-lanceolate. Corolla rotate, purple, smooth internally and externally, the margin ciliolate; segments oblong, obtuse. Gynostegium nearly sessile. Pods 3 inches long, 4 lines in diameter, tapering at each end, slightly pubescent. Resembles S. crispum, *Benth.*, but that is a humbles pecies, (only half a foot long,) the peduncles barely equal the petioles, and the exterior stamineal crown is annular; while in our plant it forms a distinct cup.

SARCOSTEMMA HETEROPHYLLUM (*Engelm. MSS.; Torr. in Pacif. Railroad Rep.* 5, *p.* 363): puberula, volubile; foliis anguste-linearibus brevi-petiolatis acutis basi cordatis v. cordato-hastatis (raro) acutiusculis; pedunculis plurifloris petiolo multo longioribus; corollæ laciniis patulis ovatis acutis ciliatis extrorsum puberulis introrsum glabris (purpurascentibus;) corona stam. exteriore pateriformi integra, inter. foliolis suborbiculatis gynostegium subæquantibus; folliculis longe attenuatis. Ravines and rocky places, borders of the Rio Grande, western Texas, New Mexico, and Chihuahua, westward to Sonora and San Luis Rey, California, April—June. (No. 1681, *Wright.*) Stems numerous, from a somewhat ligneous base, 1–3 feet long, slender. Leaves 1–2 inches long, ½–2½ lines wide, the lower and middle ones more or less cordate, or cordate-sagittate at the base, the lobes entire or denticulate; uppermost leaves sometimes acute at each end; petioles 2–4 lines long. Peduncles 1–2 inches long; umbel 8–12-flowered, the pedicels much shorter than the peduncles. Flower about one-third of an inch in diameter; exterior corona in the form of a shallow cup. Gynostegium nearly sessile. Corolla brownish purple. Near S. lineare, *Benth.**

* We have Sarcostemma clausum, *Roem. & Schult.*, from Key West, where it was found by the late Mr. Blodgett.

SARCOSTEMMA HETEROPHYLLUM; var.? umbellis 5–8-floris, pedicellis pedunculo subæqualibus; floribus majoribus; corollæ laciniis oblongis obtusis. Gravelly hills, Rock Creek, and near Camp Bache, also at the mouth of the Great Cañon of the Rio Grande, June—July. (No. 1679, *Wright.*) Perhaps distinct from S. heterophyllum: we have seen no intermediate forms. The leaves are usually longer and wider; the flowers are of a dull purple color, and the segments of the corolla are more strongly ciliate. Gynostegium distinctly stipitate. Follicles 4 inches long, acute at the base, and tapering to a long point.

ASCLEPIAS SULLIVANTII, *Engelm. in Gray's Manual, ed.* 2, *p.* 352. Hill sides, Muerte and Rock Creek; also at the Copper Mines, July—August; *Bigelow.* The pods are sometimes almost entirely free from warts or spines. Leaves often very obtuse, or even emarginate.

ASCLEPIAS JAMESII (n. sp.): glaberrima, subglauca; foliis orbiculato-obovatis subcoriaceis retusis vel emarginatis basi cordatis brevissime petiolatis; umbellis multifloris brevi-pedunculatis; gynostegio constricto; cucullis dilatatis truncatis; processu arcuato falciformi acutissimo exserto; folliculis ovatis lævibus. A. obtusifolia var.? latifolia, *Torr. in Ann. Lyc.* 2, *p.* 117. Plains near the Limpio Mountains, July; *Bigelow.* Tascate, Sonora, July; *Parry.* (No. 1682, *Wright.*) Stem stout, 1–2 feet high. Leaves 3–4 inches long, and 2½–3½ wide, somewhat coriaceous, transversely and reticulately veined, mostly retuse or emarginate, with a small abrupt point; the lower ones almost orbicular; petiole 1–3 lines long. Umbels several, in the axils of the upper leaves. Peduncles 2–4 lines long. Flowers much resembling those of A. Sullivantii. Corolla greenish; segments broadly ovate. Hoods of the crown purplish, very broad, obliquely truncated, the horn with the acute point exserted and projected partly over the stigma, the upper margin undulately 2–3-toothed. Horny margins of the anthers angularly dilated at the base. This species was first discovered by Dr. James, on Long's Expedition to the Rocky Mountains, and was doubtfully regarded as a variety of A. obtusa in my account of the plants collected by that botanist. It was afterwards found by Lieut. Abert, as well as by Fendler, in New Mexico.

ASCLEPIAS EROSA (n. sp.): puberula deinde glabrata; caule erecto simplici; foliis oblongo-ovatis subcoriaceis acuminatis sessilibus margine eroso-denticulatis; umbellis multifloris; pedunculis folio duplo brevioribus; cucullis obovatis obtusis longioribus; gynostegio constricto, processu subulato arcuato longe horizontaliter exserto; folliculis ovatis, acuminatis lævibus.—Valley of the Gila river, near Metate, May—June; *Schott, Thurber.* Stem apparently 2–3 feet high, stout. Lower leaves 5–7 inches long, and 2½ broad, with a long acute point, very rough on the margin, with irregular conspicuous cartilaginous serratures. Umbels 5 to 7, about half as long as the leaves; pedicels 1½ inch long, pubescent. Flowers as large as in A. Cornuti. Corolla greenish white; segments at length reflexed. Hoods of the crown obliquely truncate at the summit, the subulate horn exserted horizontally. Pods (immature) about 2 inches long, and nearly an inch in diameter at the middle.—Apparently allied to A. glaucescens, *H. B. & K.*, but that species has obtuse leaves, much shorter pedicels, and a subsessile gynostegium, which is about the length of the hoods.

ASCLEPIAS ARENARIA (n. sp.): incano-pubescens, deinde glabrescens; caule simplici; foliis oppositis obovatis vel inferioribus ovatis breviter petiolatis, superioribus emarginatis vel retusis; pedunculis brevibus multifloris, cucullis dilatatis obtusissimis utrinque unidentatis gynostegio subsessili longioribus, processu subulato apice subrecurvo; folliculis oblongis attenuatis lævibus.—Sandy banks; Journado del Muerte, and on the upper Rio Grande, in New Mexico, June—July. Plant 12–18 inches high, (apparently sometimes assurgent or prostrate.) Leaves

2½–4 inches long, and 1½–2½ inches wide, when old nearly glabrous and somewhat coriaceous; petiolcs 2–3 lines long. Peduncles scarcely an inch long. Umbels several, in the axils of the upper leaves, 15–25-flowered. Corolla greenish white; hoods dull pale purple. Follicles 4 inches long, and an inch in diameter in the middle, attenuated to a long point. Allied to A. Jamesii.

Asclepias nummularia (n. sp.): caule humili; foliis oppositis orbiculatis albo-lanatis; pedunculis folio longioribus; cucullis ovatis gynostegio sessili subduplo longioribus, processu falcato vix exserto. (Table XLV, A.) Copper Mines, New Mexico, April; *Bigelow, Thurber.* Santa Maria, Chihuahua; *Parry.* Santa Cruz, Sonora; *Capt. E. K. Smith.*—Stems several from a thick ligneous root-stock, 1–2 inches long. Leaves in 2 or 3 closely approximated pairs, 1–1½ inches in length and breadth, with a very short abrupt acumination, often slightly cordate at the base, clothed with a softly white pubescence. Peduncles 2 or 2½ inches long; umbel 15–20-flowered, the pedicels about three-fourths of an inch long. Corolla greenish white; the segments oblong and reflexed. Hoods obliquely truncate inward, entire, somewhat spreading. Projecting margins of the anthers rounded. Pollen-masses triangular. Immature pods ovate, tomentose.—A remarkable species; very distinct from any other of the genus. It has much the habit of Steinheilia radians, as represented in *Deless. Ic.* 5, *t.* 61.

Asclepias involucrata (*Engelm. MSS.*): caulibus e basi lignoso brevi pluribus; foliis oppositis alternisve lineari-lanceolatis brevi-petiolatis margine tomentosis; umbellis terminalibus sessilibus foliis 2–4 involucratis; cucullis ovatis acutiusculis patentibus gynostegio subduplo longioribus; processu cultriformi vix exserto; folliculis ovato-oblongis lævibus.—Sandy soils, on the Mimbres and near the Copper Mines; also sandy plains between Laguna de Guzman and the Rio Grande; April—May; *Bigelow, Thurber.* San Luis mountain, Sonora; *Capt. E. K. Smith.* (No. 1690, *Wright.* No. 107, *Fendler.*) Stems 3–6 inches long, erect or spreading, somewhat pubescent. Leaves 1½–2½ inches long, opposite and alternate, mucronate, nearly smooth above, except on the margin, a little pubescent on the veins underneath. Umbel 10–15-flowered, involucrate, with 1–2 pairs of leaves similar to those of the stem. Pedicels about three-fourths of an inch long. Corolla greenish white, the segments ovate and reflexed. Hoods spreading, and their points often a little recurved. Margin of the anthers projecting and acutely angular at the base. Pollen-masses pyriform. Pod 2½ inches long, and ¾ inch in diameter, acute, but scarcely attenuated at the summit.

Asclepias brachystephana (*Engelm. MSS.*): caule ramoso; foliis oppositis lineari-lanceolatis longe angustatis basi in petiolum brevem attenuatis glabratis; umbellis pluribus extra-axillaribus pedunculatis plurifloris; cucullis truncatis antice bidentatis gynostegio sessili dimidio brevioribus, processu falciformi verticali; folliculis oblongis lævibus.—Sandy soils, Valley of the upper Rio Grande, Chihuahua, and Sonora; April—July. (No. 1692, *Wright.*) Dr Gregg found it in dry valleys west of Saltillo. Stem 8–12 inches long, branching from the base upward. Leaves 3–6 inches long, gradually tapering from a rather broad base to a long narrow point; petiole 2–3 lines long. Umbels 3–8 on each branch, the peduncles much shorter than the pedicels. Corolla dull purple, the segments ovate-oblong, reflexed. Cuculli broader than long, the inner margin produced into a tooth above. Margins of the anthers angular at the base. Pollen-masses pyriform. Pods 2 inches long, acuminate.

Asclepias incarnata, *Linn. Sp. p.* 314; *Decaisne, l. c. p.* 567. Copper Mines, New Mexico, July; *Bigelow.* Var. foliis lato-linearibus vix puberulis. Banks of Devil's river, western Texas, September; *Bigelow.* Lower Rio Grande; *Schott, Wright.*

ASCLEPIAS TUBEROSA, *Linn. Sp. p.* 316; *Decaisne, l. c.* Western Texas, New Mexico and Sonora, June—July.

ASCLEPIAS PARVIFLORA, *Willd. Sp.* 1, *p.* 1267? Ravines head of Rock Creek, western Texas, July; *Bigelow.* (No. 1684, *Wright.*) Many years ago, Prof. L. K. Gibbes, in his Catalogue of the Plants of Columbia, South Carolina, (*p.* 11,) showed that the seeds of this species (at least in his specimens) "want the usual comose appendage of the genus!" I have verified his observation in specimens from various parts of the southern States. In Dr. Bigelow's plant the seeds are crowned with a tuft of hairs, and yet I cannot find that it differs in any other respects from the common A. parviflora, except that the flowers are about one-third larger.

ASCLEPIAS VERTICILLATA, *Linn. Sp. p.* 315; *Decaisne, l. c.* A. linearis, *Scheele in Linnæa*, 21, *p.* 758. Plains between Van Horne's Wells and Muerte, July; *Bigelow.* Guadalupe river, Texas; *Schott.*

Var. GALIOIDES, *Decaisne, l. c.* A. galioides, *H B. K.* Near San Elcearío, May; *Parry.* New Mexico and Sonora; common. (No. 1685, 1686 and 1689, *Wright.*) Our plant seems to be the same as Hartweg's No. 216.

ASCLEPIAS FASCICULARIS, *Decaisne, l. c. p.* 569. A. macrophylla, *Nutt. Pl. Gamb. in Journ. Acad. Sc. Philad.* (*n. ser.*) 1, *p.* 180. Grassy places near San Luis Rey, California, October, (in fruit); *Parry.* Variable in the breadth of the leaves.

ASCLEPIAS LINARIA, *Cav. Ic.* 1, *p.* 42, *t.* 57, *ex Decaisne, l. c. p.* 570. Sierra de Pajarito, Yanos, Sonora, May; *Schott.* Between Saltillo and San Luis Potosi; *Berlandier* (No. 1350) *& Gregg* (No. 562.)

ASCLEPIAS MACROTIS (n. sp.): nana, suffruticosa; caule ramosissimo; ramulis rigidis unifariam puberulis; foliis oppositis anguste linearibus glabris mucronatis; pedunculis brevibus extra-axillaribus paucifloris; cucullis longissime lineari-attenuatis patulis margine pubescentibus; processu obtuso vix exserto; gynostegio sessili brevissimo. (TAB. XLV, B.) Rocky hills near El Paso, and on the mountains below San Elcearío, May—June; *Bigelow, Parry.* (No. 1691, *Wright.*) Stem about a span high intricately branched from the thick crooked base, which is somewhat ligneous, the branches terete. Leaves 1–1½ inch long and half a line wide, revolute on the margin. Umbels 4–5-flowered. Peduncles 2–3 lines long; pedicels 4–5 lines. Segments of the calyx lanceolate. Corolla pale purple; the segments ovate and reflexed. Hoods with an ovate base, their elongated tapering extremities diverging horizontally; the horn slightly curved, short and obtuse, pubescent near the summit. Gynostegium very short, closely sessile, anthers broader than long, with narrow cartilaginous margins. Pollen-masses elongated pyriform. Pods oblong, lanceolate, acuminate, even. This very remarkable species has been found only in the places mentioned above. It has much the appearance of Gomphocarpus revolutus of South Africa.

ASCLEPIAS (OTARIA) LONGICORNU, *Benth. Pl. Hartw. p.* 24; *Decaisne, l. c. p.* 570. A. Lindheimeri, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 42, (*No.* 272.) Plains and rocky places, New Mexico and western Texas, along the middle and lower Rio Grande, June—September. Borders of Aqua Fria river, Mexico; *Gregg.* (No. 1683, *Wright.*)

ASCLEPIAS SUBULATA, *Decaisne, l. c. p.* 571; *Torr. in Pacific R. Road Expl.* 6, *p.* 362, *t.* 7. Lower California, near the Mexican boundary line; *Parry.* Ravines and hills sides of the desert, near Fort Yuma, June; *Schott.*

SEUTERA MARITIMA, *Decaisne in DC. Prodr.* 8, *p.* 590. Cynanchum angustifolium, *Pers. Syn.* 1, *p.* 274; *Nutt. Gen.* 1, *p.* 164. Saline marshes near the sea coast, western Texas; *Wright.*

GONOLOBUS GRANULATUS (*Scheele in Linnæa* 21, *p.* 759.): volubilis pilis patentibus vel reversis hirsutus; foliis longius petiolatis ovatis acuminatis profunde cordatis; pedunculo petiolum superante; umbellis paucifloris; corollæ laciniis ovatis obtusis reticulato-venosis extus pilosiusculis, intus glabris; corona stam. annuliformi; gynostegio substipitato applanato; antherarum cuspidibus tenuissimis inflexis; stigmate nudo; folliculis lanceolatis sparsim echinatis glabris. Mountain ravines, near Live Oak Creek, September; *Bigelow.* Sonora; *Schott.* Monterey, Neuvo Leon; *Dr. Edwards and Major Eaton.* (No. 543 and 1674, *Wright. No.* 350 *Lindheimer's Texan Coll.* 1846.) Stem herbaceous, twining over shrubs and small trees. Leaves varying from 2–3½ inches long, and 1½–2½ inches wide, slightly pubescent on both sides; the petiole 8–10 lines long. Peduncles usually about one-fourth longer than the petioles. Umbel (or rather very short raceme) 4–8-flowered; the longer pedicels about an inch in length. Flowers 5 or 6 lines in diameter. Calyx hairy; the segments lanceolate. Corolla rotate, greenish or purplish, with darker reticulated veins. Stamineal crown reduced to a narrow ring. Anthers with the membranous appendage very thin and inflexed under, not lying on the stigma. Pollen-masses obliquely obovate. Stigma obtusely 5-angled, flat. Follicles 4½ or 5 inches long and about ¾ inch in diameter, armed with distant, subulate, rather firm prickles.

LACHNOSTOMA? PARVIFLORA (n. sp.): humifusum, pilosum; foliis ovatis vel orbiculato-ovatis acutis brevi-petiolatis; pedunculis folio multo-longioribus; floribus primo umbellatis deinde racemosis; corolla rotata, laciniis ovatis; coronæ stam. phyllis 10 biseriatis, 5 exterioribus alte bifidis laciniis acuminatis, 5 interioribus subulatis utrisque gynostegio longioribus; folliculis ovato-oblongis spinis innocuis villosis dense onustis. San Pedro Creek, western Texas; *Wright,* (No. 1673.) Table-land between Ringgold Barracks and Laredo, on the lower Rio Grande, June—July; *Schott.* Root tuberous. Stem clothed with a gray spreading pubescence, branching from the base; the branches 8–12 inches long. Leaves varying narrowly to broadly ovate, about three-fourths of an inch long, usually waved and often crisped on the margin. Peduncles axillary and subterminal, at first only a little longer than the leaves, but in fruit twice or thrice longer. Umbels or racemes 5–10-flowered. Corolla about 2½ lines in diameter, purplish. Stamineal crown consisting of 10 distinct leaflets in a double series; the 5 exterior cleft about halfway down, the points curved over the stigma; the 5 interior subulate, arising from the base of the exterior leaflets, which they considerably exceed in length, and are likewise curved over the stigma. Gynostegium sessile. Pollen-masses nearly orbicular. Pods 2–3 inches long, densely covered with short thick rather fleshy processes. This plant can scarcely be referred to any of Decaisne's genera, but I am unwilling to propose a new genus for its reception while my knowledge of the Mexican Asclepiadaceæ is so imperfect.

GONOLOBUS BIFLORUS, *Nutt.* Chthamalia biflora, *Decaisne in DC. Prodr.* 8, *p.* 605. Dry prairies, western Texas; *Wright,* (No. 543.) New Braunfels, *Lindheimer,* (No. 162.) Stems prostrate, 1–2 feet long, not twining. Flowers dark purple. Lobes of the stamineal crown with an internal ridge which is produced into an inflexed curved process. Follicles 3–4 inches long, echinate with soft prickles. C. pubiflora, *Decaisne, l. c.,* is Gonolobus prostratus of Elliott, but not of R. Brown.

GONOLOBUS (CHTHAMALIA) CYNANCHOIDES, *Engelm. & Gray, Pl. Lindh. pars I, p.* 43. Western Texas, *Wright.* Nearly related to the last, but differs in the smaller flowers, and in the short excavated process of the lobes of the corona. (No. 545, *Wright.* No. 1951, *Berlandier.*)

GONOLOBUS (CHTHAMALIA) PRODUCTUS (n. sp.): caule volubili pubescente; foliis ovatis longe

acuminatis cordatis, auriculis approximatis rotundatis puberulis; pedunculis petiolis subæqualibus 3–5-floris; corolla campanulata, tubo brevi, laciniis lanceolatis erectis; corona stam. cupuliformi crenato gynostegio breviore; folliculis (immaturis) lævibus. Climbing over bushes. Banks of Rock Creek; *Bigelow*. Valley of the Limpio, and along the Rio Grande, June; *Parry*, (No. 1675, *Wright*.) It was also found by Dr. Gregg, in Cadena, Mexico. Plant 2–4 feet long, twining around low bushes or trailing on the ground. Lower leaves about 2 inches long; the deep sinus at the base often almost closed by the approximation of the auricles. Sepals ovate-lanceolate, with a minute gland on the inside of each sinus. Corolla about 4 lines long, mostly of a dull purple color, but sometimes greenish. Stamineal crown a shallow cup, about two-thirds the length of the gynostegium, with the margin crenate or slightly lobed. On the inside are 5 adnate processes which are connected with the gynostegium and outwards terminate in a short tooth which is not exserted. Stigma obtusely 5 angled. Pollen-masses short and roundish. There are no ripe pods in the collections.

GONOLOBUS(?) PARVIFOLIUS (n. sp.) pubescens; caule prostrato ramosissimo vix volubili; foliis (semiuncialibus) deltoideo-ovatis basi cordatis crassiusculis; floribus axillaribus solitariis vel geminis sessilibus; corolla urceolato-rotata ad mediam usque 5-lobata; corona stam. 5-loba, lobis ovatis obtusis gynostegio brevioribus; folliculis lineari-lanceolatis longe attenuatis lævibus. Sides of hills, cañon of the Rio Grande, below Mt. Carmel, October; *Parry*. Mountain near the Limpia, western Texas; *Wright*. Stem 12–18 inches long, the upper branches somewhat twining. Leaves 4–6 lines long, deltoid or sometimes hastate-cordate, rather acute, mucronate; petioles half as long as the lamina. Flowers on short axillary pedicels. Corolla about 2½ lines in diameter, dull yellow, (brown when dry;) the lobes triangular-ovate. Stamineal crown 5-lobed, the lobes obtuse or slightly emarginate, concave, with a prominent ridge on the inside. Stigma obtusely 5-angled, flat. Pods 3½ inches long, tapering to a long slender point.

OLEACEÆ.

FRAXINUS SCHEIDEANA, *Schlecht. & Cham. in Linnæa*, 6, *p.* 391; *DC. Prodr.* 8, *p.* 278. Var. PARVIFOLIA: foliolis 1–3-jugis vix uncialibus. Rocky places in limestone districts on the Rio Grande, from the San Pedro to the Pecos; *Schott*. Mountains of Santa Rosa, Cohahuila; *Bigelow, Parry*. A graceful shrub 5 or 6 feet high.

FRAXINUS VIRIDIS, *Michx. f. Sylv.* 2, *p.* 197, *t.* 120. Var. BERLANDIERIANA. F. Berlandieriana, *DC. l. c.* Near Eagle Pass on the Rio Grande; *Bigelow*. (No. 602 and 2112, *Berlandier*. No. 653 (Coll. 1846) and No. 41, (Coll. 1847,) *Lindheimer*.) Leaflets 5–7, or often 3, mostly cuneate at the base, shining on the upper surface; the teeth larger and more salient than in the F. viridis of the Middle States; the fruit also is more acute.

FRAXINUS PISTACIÆFOLIA, *Torr. in Bot. Whippl. Rep. p.* 128. F. velutina, *Torr. in Emory, Rep. p.* 149. On the Rio Grande and its tributaries. Near the Copper Mines, New Mexico; *Bigelow*. (No. 1697, *Wright*.) Ojito, Mexico; *Gregg*. Sonora; *Schott*. A downy variety, with narrowly lanceolate attenuate leaves, was found by Mr. Thurber at Guadalupe Cañon, Chihuahua. This species often grows from 15–20 feet high. Sometimes it attains the height of 30 feet. The fruit is often 3-winged.

FRAXINUS CUSPIDATA (n. sp.): foliolis 2–3-jugis lanceolatis vel oblongo-lanceolatis acutis cuspidatis serratis vel integerrimis utrinque glabris longe petiolulatis; samaris oblongis utrinque obtusis. Eagle Mountains and Great Cañon of the Rio Grande; *Parry, Bigelow*. (No. 1698,

Wright,) (mixed in my set with F. pistaciæfolia.) A well characterized species, easily known by the small fruit (scarcely 8 lines long,) which is broad in proportion and not contracted at the base. The leaflets are narrower and entire in Mr. Wright's specimen, while in Dr. Parry's they are broader and mostly serrate.

FRAXINUS DIPETALA, *Hook. & Arn. Bot. Beech. p.* 362, *t.* 87. Var.? TRIFOLIOLATA: foliolis unijugis ovatis vel obovatis integerrimis aut versus apicem crenato-serratis basi in petiolulum attenuatis; samaris lineari-oblongis emarginatis. Sterile mountains a few miles south of the Mexican boundary line, in Lower California, July (in fruit); *Parry*. A shrub or small tree growing in clumps, sometimes 20 feet high, with a trunk three inches in diameter. Leaflets never more than a single pair and a terminal one; sometimes, indeed, reduced to the single terminal one; the largest scarcely more than an inch long; common petiole channelled above. Flowers not known. Fruit in a loose cymose panicle, about three-fourths of an inch long, and 2¼ lines wide, (in one specimen 3 lines wide,) only a little contracted at the base. As the flowers of this ash are unknown, and the fruit of F. dipetala has not yet been seen, it remains uncertain whether they are distinct, or are only extreme forms of one species.

FORESTIERA PHILLYREOIDES. Piptolepis phillyreoides, *Benth. Pl. Hartw. p.* 29. Var. SPATHULAEFOLIA: foliis spathulatis subcoriaceis. Near Monterey, Neuvo Leon and plains west of San Pablo; *Gregg*. A shrub about 5 feet high. Not yet found in fruit. There can be no doubt of the identity of Piptolepis and Forestiera. The flowers of both agree in all essential characters. We place this genus in Oleaceæ where we have for many years regarded it as belonging, adopting the view of Richard, who more than half a century ago, said of it "genus affine Chionantho."* Other authors have pointed out its affinity to Oleaceae; but more recently Tulasne.† has clearly shown that this is its true place.

FORESTIERA LIGUSTRINA, *Poir. Enc. Suppl.* 2, *p.* 664. F. pubescens, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 177. Adelia ligustrina, *Michx. Fl.* 2, *p.* 224. Borya ligustrina, *Willd. Sp.* 4, 711; *Pursh, Fl.* 2, *p.* 22. Borders of the Rio Grande in western Texas, and in Chihuahua. Leaves about an inch long, obovate or obovate-oblong, mostly obtuse, abruptly narrowed at the base with a short petiole, slightly serrate, when young pubescent, but at length nearly glabrous except along the midrib and on the petioles. Fruit oblong, about 4 times longer than the pedicels, dark blue, the pulp rather thick and sweetish. Nut nearly even. This is not an uncommon plant in Florida, and on the upper waters of the Red and Arkansas rivers. Michaux has incorrectly described the leaves as *very entire*.

FORESTIERA RETICULATA (n. sp.): foliis ovatis ramulisque glabris acutis vel acuminatis subcoriaceis prominente reticulato-venosis denticulato-serratis subtus porulosis; cymulis simplicibus; fructibus ovalibus, obtusis apiculatis pedicellis ½ longioribus. Crevices of rocks and in ravines near the Pecos, on the Rio Grande; *Schott*. Ravines near White Oak Creek; *Bigelow*. Western Texas; *Wright*, No. 565. Branches glabrous, but dotted with minute whitish warts. Leaves 1–1½ inch long, acute at the base, the veins strongly reticulated, especially (in the dry specimens) on the upper surface; the midrib very slightly pubescent underneath. Staminate flowers in small simple cymules with short pedicels. Fertile cymules 3–5 flowered. Fruit about 3 lines long, very dark purple, with a thin sweet pulp, sometimes 2-celled and 2-seeded. Nut oblong, the shell thin and fragile, marked with prominent longitudinal veins. Seed conformed to the cavity of the shell; testa thin pale brown, slightly sulcate longitudinally. F. porulosa,

* Forestiera differs from Chionanthus chiefly as from Fraxinus ornus.

† Annales des Sc. Nat., ser. 3, 15, p. 254.

Poir., (Adelia porulosa, *Michx.*) which much resembles this species, differs in its entire obtuse leaves, narrowly revolute on the margin.

FORESTIERA SPHÆROCARPA (n. sp.): foliis ad apicem ramulorum aggregatis, rhomboideo-oblongis parvulis acutiusculis superne crenato-serratis utrinque pubescentibus; cymulis fœmineis trifloris; pedicellis pubescentibus fructu subgloboso vix dimidio brevioribus. Dry ravines near the Limpio, July (in fruit); *Bigelow.* Leaves about three-fourths of an inch long, somewhat coriaceous, usually 4 or 5 together in a cluster at the extremity of the short branchlets. Fruit the size of a pepper-corn, with a thin pulp, dark purple and covered with a bloom. This species is easily distinguished by the small fasciculate leaves and small subglobose fruit.

FORESTIERA ANGUSTIFOLIA (n. sp.): foliis fasciculatis lineari-spathulatis vel anguste-lanceolatis integerrimis obtusis glabris obsolete venosis subtus porulosis; fructibus ovatis acutis. Western Texas near the Rio Grande; *Wright*, No. 566. Near New Braunfels and shore of Matagorda Bay, February; *Lindheimer.* Matamoras, Tamaulipas; *Berlandier*, No. 3024. Mexico; *Gregg.* A large shrub, densely branched. Leaves in fascicles of 3 to 5, on very short spurs, or undeveloped branches. They are 8–10 lines long and 2–2½ lines wide, somewhat coriaceous. Cymules 3–5-flowered arising from the centre of the tuft of leaves. Bracteoles broadly obovate. Flowers hermaphrodite, 3–4-androus. In Berlandier's specimens the leaves are narrowly lanceolate, more coriaceous, and revolute when dry.

JASMINACEÆ.

MENODORA SCABRA, *Gray, in Sill. Journ. n. ser.* 14, *p.* 44; *Torr. in Bot. Pacif. R. Road Rep.* 7, *p.* 18, *t.* 7. Western Texas and New Mexico; *Parry, Bigelow.* Arroyo del Pozo Verde, Sonora, July; *Schott.* Ojo de Vaca, etc., Chihuahua; *Thurber.* (No. 563 and 1694, *Wright.*)

MENODORA LONGIFLORA, *Gray, l. c.* Ravines and rocky hills along the Rio Grande and its tributaries. (No. 1695 and 1696, *Wright.*)

MENODORA HETEROPHYLLA, *Moricand in DC. Prodr.* 8, *p.* 316; *Gray, l. c.* Sandy plains and borders of streams, western Texas and Neuvo Leon; May—October.

ARISTOLOCHIACEAE.

ARISTOLOCHIA CALIFORNICA, *Torr. Bot. Whipp. Rep. p.* 128. Napa county, California, March; *Thurber.*

ARISTOLOCHIA LONGIFLORA, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 51. Sandy alluvions of the Rio Grande, below the mouth of Los Moras, August; *Schott.*

ARISTOLOCHIA BREVIPES, *Benth. Pl. Hartw. p.* 15. A. Wrightii, *Seemann, Bot. Herald, p.* 330, *t.* 72. Dry rocky ravines northwestern Texas, Chihuahua, and Sonora. (No. 567, 568, and 1700, *Wright.*) No. 1701 of Wright is a form with the lobes of the leaves narrower and less rounded at the extremity. Mr. Seemann's plant was collected in Durango.

NYCTAGINACEÆ.

SELINOCARPUS DIFFUSUS, *Gray, l. c;* var. PARVIFOLIUS: foliis parvis (vix semi-pollicaribus); floribus solitariis. Cañons of the Rio Grande, October; *Parry.* Presidio del Norte, August; *Bigelow.*

OXYBAPHUS GLABRIFOLIUS, *Vahl. Enum.* 2, *p.* 40? Western Texas, near the Rio Grande, below El Paso. This seems to have been collected only by Mr. Wright in his earlier explorations. It is his No. 605. Although the involucres are mostly 2 or 3-flowered, it may be only a variety of O. glabrifolius.

OXYBAPHUS AGGREGATUS, *Vahl l. c.* Plains near the Limpio, Texas; *Bigelow.* (No. 1717, *Wright.*)

NYCTAGINACEÆ.

MIRABILIS LONGIFLORA, *Linn.*; *Choisy in DC. Prodr.* 13, *pars* 2, *p.* 428. Copper Mines, New Mexico, July; *Bigelow, Thurber.* Mountains east of El Paso, *Wright*, No. 575. his No. 1702 is a glabrous or glabrate form of the species.

MIRABILIS MULTIFLORA, *Gray.* Oxybaphus multiflorus, *Torr. in Ann. Lyc. N. York*, 2, *p.* 237. Quamoclidion multiflorum, *Torr.*; *Gray, N. Gen. & Sp. Nyct. in Sill. Jour. ser.* 2, 14, *p.* 321. Nyctaginia Torreyana, *Chois. l. c.* Valley of the Rio Grande and at the Copper Mines, April—August. San Felipe, California; *Parry.* (No. 1703, *Wright*; 740, *Fendler*; 1327, *Coulter*, Mex. Coll.)

MIRABILIS OXYBAPHOIDES, *Gray.* Quamoclidion oxybaphoides, *Gray, l. c.* Western Mexico; *Bigelow, Wright.*

MIRABILIS CALIFORNICA, *Gray.* Oxybaphus lævis, *Benth.?* O. glabrifolius, *Torr. Bot. Whipp. Rep. p.* 131, non *Vahl.* (TAB. XLVI.) Dry hills, San Diego, California; *Parry, Thurber.* Somewhat prostrate, forming dense tufts commonly more or less pubescent, and rarely glabrate.

OXYBAPHUS NYCTAGINEUS, *Sweet; Choisy, l. c.* Western Texas and New Mexico; also in the adjoining Mexican States of Chihuahua and Cohahuila, near the Rio Grande. An extremely variable species, as is shown by Dr. Gray in his note below.

OXYBAPHUS HIRSUTUS (*Sweet; Choisy, l. c.*): caule pilis patentibus hispido; foliis lanceolatis pilosis utriusque angustatis brevipetiolatis margine undulatis ciliatisque; involucris subsolitaris axillaribus; pedunculis (3–4 linearibus) demum reflexis; involucris subtrifloris; fructu hirsuto inter costas corrugato.—Gravelly hills on the Limpio, &c., July; *Bigelow, Wright.* Stem 12–15 inches high, apparently sometimes assurgent, branching from the base, hispid with short-spreading or reflexed hairs. Leaves 2–2½ inches long, and 4–5 lines wide in the middle; the uppermost ones more undulate than the lower. Peduncles slender, in the axils of the upper leaves; the uppermost ones appearing clustered from the branches being undeveloped. Involucre hairy, at length broadly campanulate and reticulate. Flowers all fallen in our specimens. Fruit 2½ lines long, obovate.

OXYBAPHUS ANGUSTIFOLIUS, *Sweet; Choisy, l. c. p.* 433. Plains and river alluvions, western Texas, New Mexico and Chihuahua; June—September.

OXYBAPHUS COCCINEUS (n. sp.): glaberrimus; caule gracili ramosissimo erecto; foliis linearibus elongatis integerrimis; panicula terminali laxa; involucris 3-floris campanulatis 5-fidis, segmentis acutis; perigonio infundibuliformi (coccineo) involucro 4–5-ties longiore; fructu clavato-oblongo profunde sulcato. Hill sides, Copper Mines, and on the Mimbres; *Wright*, (No. 1723) *Thurber, Bigelow.* Highlands between the Nueces and San Pedro; April—June; *Schott.* Santa Cruz Mountains, Sonora; *Capt. E. K. Smith.* Root ligneous, black and tortuous. Stems 12–18 inches high, slender terete, paniculately branched above. Leaves 2–3 inches long, and mostly about a line wide, but sometimes 2 lines. Inflorescence a loose cymose panicle. Involucres sometimes solitary in upper axils and the pedicels recurved. Perianth about three-fourths of an inch long, funnel-form, with a long narrow tube; the limb of a bright crimson, 5-lobed, with the lobes notched. Stamens and style exserted. Fruit pubescent, strongly 5-ribbed and slightly rugose. This species is almost intermediate between Oxybaphus and Quamoclidion.

ALLIONIA INCARNATA, *Linn.*; *Choisy, l. c.* Sandy river-banks and on gravelly hill-sides. Common in New Mexico, western Texas, and Chihuahua, westward to Sonora and California; flowering from April to September. (No. 1716, *Wright.*) The 3 leaves of the involucre are ovate, concave, and are scarcely at all united at the base. Perianth campanulate-funnel-form,

mostly 4-lobed, the lobes notched. Stamens usually 3, not exserted. Fruit oval, the margin winged, usually 4–6-toothed on each side, and reflexed over the back, so that the opposite sides nearly meet, and thus partially conceal two longitudinal dorsal rows of spherical stipitate glands. Achenium oblong, apiculate with the persistent base of the style.

ABRONIA CYCLOPTERA, *Gray, l. c. p.* 319. A. (Tripterocalyx) micrantha, *Torr. in Frem. 1st Rep. p.* 96. Sandy places on the Rio Grande, from Doña Ana to San Elcearío, April, June; *Wright*, No. 1712.

ABRONIA ARENARIA, *Menz. in Hook. Exot. Bot. t.* 193; *Choisy, l. c.* Sea beach, Monterey, California; *Parry.* Flowers bright rose-color. Perennial fusiform root sometimes 4 feet long and 2 inches in diameter. It is said to be eaten by the Indians. Common along the coast of California, and extending to Puget's Sound.

ABRONIA UMBELLATA, *Lam. Ill. t.* 5; *Hook. l. c. t.* 194; *Choisy, l. c.* Abundant on the coast of California. Root smaller and more branching than in the preceding species; *Parry.*

ABRONIA MELLIFERA, *Dougl. in Hook. Bot. Mag. t.* 2879; *Choisy, l. c.* Sandy hills near El Paso, etc., westward to the Colorado, California, April—June The wings are triangular and terminate abruptly at the summit, where they are dilated laterally, so that the fruit appears truncated or turbinate. The body of the fruit is much shorter than in the next species.

ABRONIA FRAGRANS, *Nutt. MSS.; Hook. Kew Jour Bot.* 5, *p.* 261; *Torr. & Gray, Bot. Beckwith Rep. p.* 14, *t.* 10. Sandy hills on the upper Rio Grande, and west to Chihuahua, April to August. The mature fruit is distinctly but narrowly 5-winged. What was cited as a dwarf form of A. mellifera in *Bot. Whippl. Rep. p.* 131, is A. fragrans.

NYCTAGINIA CAPITATA, *Choisy, l. c.* Western Texas and valley of the Rio Grande, common. (No. 1709, *Wright;* 680, *Lindheimer, &c.*)

ACLEISANTHES LONGIFLORA, *Gray, l. c.* (TAB. XLVI.) Sandy soils, western Texas and valley of the Rio Grande, on both sides of the river, June—October. (No. 599 and 1704, *Wright.*) The stamens and style are frequently much exserted in the later flowers, as they are in those of A. Berlandieri.

ACLEISANTHES ANISOPHYLLA, *Gray, l. c.* In alluvial soil, Turkey creek, and on Rio San Pedro, western Texas. (No. 598 and 1706, *Wright.*)

ACLEISANTHES BERLANDIERI, *Gray, l. c.* Nyctaginia obtusa, *Choisy, l. c. p.* 429. Near Laredo, lower Rio Grande, June; *Schott.* (No. 1705, *Wright;* No. 1544, 2007, 3044, and 3203, *Berlandier.*) Leaves mostly acute. Flowers white, striped with pale purple.

ACLEISANTHES CRASSIFOLIA, *Gray, l. c.* On the Rio Grande, from Los Moros up to the Pecos, October; *Schott.* (No. 599*a*, *Wright.*)

PENTACROPHYS WRIGHTII, *Gray, l. c. p.* 318. (TAB. XLVII, B.) Rocky hills near Leon Springs, Mexico, September; *Bigelow.* Between Victoria and San Antonio, Texas; *Schott.* In all our specimens the flowers are expanded, with a slender tube an inch and a half long and exserted stamens. The fruit of these flowers differs from that of the unexpanded precociously fructified ones from which Dr. Gray drew the generic character. The 5 glands, instead of being prominent and crowning the fruit, are small, rather depressed, and seated on a neck or constricted portion of the fruit a little below the summit.

SELINOCARPUS CHENOPODIOIDES, *Gray, l. c.* Gravelly hills and valleys on the Rio Grande, from El Paso to the Presidio del Norte, and westward to Ojo de Vaca, Chihuahua, April—July. (No. 1707, *Wright.*)

SELINOCARPUS ANGUSTIFOLIUS (n. sp.): subviscoso-puberulus; caule fruticuloso e basi ramosis-

simo; foliis angusto-ellipticis acutiusculis; floribus in axillis superioribus solitariis demum pendulis; perigonio infundibuliformi tubo breviusculo; staminibus 5 vix exsertis. (TAB. XLVII, A.) Gravelly table land near Presidio del Norte, August; *Parry, Bigelow.* Stem apparently diffuse, the upright branches 6–10 inches high, slender. Leaves 6–8 lines long, 1–2 lines wide; the petiole scarcely a line long. Flowers on short pedicels in the uppermost axils, some of them fructifying without being fully expanded, but mostly with a dilated funnel-form border and a tube 1–2 lines long. Stamens and style a little exserted. Fruit as in the preceding species.

BOERHAAVIA PURPURASCENS, *Gray, l. c., p.* 321. Hills near the Santa Rita, Copper Mines, New Mexico; *Wright.* Ravines and rocky hills, Presidio del Norte, July—August; *Parry, Bigelow.* The inflorescence at length becomes elongated, the flowers separating from each other and forming interrupted or somewhat verticillate spikes. The species is closely allied to B. spicata, *Choisy.*

BOERHAAVIA WRIGHTII, *Gray, l. c.* Santa Barbara, southern New Mexico, August; *Bigelow.* Near El Paso; *Wright.* Copper Mines, New Mexico; *Thurber.*

BOERHAAVIA LINEARIFOLIA, *Gray, l. c.* Arid soils; valley of the Rio Grande, and near the Copper Mines, New Mexico, June—August. The lower leaves are sometimes ovate-lanceolate.

BOERHAAVIA ERECTA, *Linn.; Choisy, l. c. p.* 450. Western Texas, New Mexico, and Chihuahua, June—August. We follow Dr. Gray in referring to this species, various forms of an annual Boerhaavia, of which there are numerous specimens in the collection. B. erecta, however, is said by Choisy to be perennial.

BOERHAAVIA PANICULATA, *Rich.; Choisy, l. c.* Western Texas, near the Rio Grande, June—August.

BOERHAAVIA ANISOPHYLLA (n. sp.): caulibus glabriusculis diffusis basi lignosis; paniculis laxe ramosissimis inferne nudis, ramulis filiformibus; foliis ovatis cordatis brevi-petiolatis glabris undulatis in eodem pari inequalibus supra pallidis subtus albidis; floribus laxe subcymosis breviter pedicellatis basi 3-bracteolatis, bracteolis persistentibus lanceolatis acutissimis; perianthiis rotatis; staminibus 5–8; fructibus obovato-oblongis glabris 5-costatis (non truncatis), costis angustis. Entrance of the Great Cañon of the Rio Grande, October; *Parry, Bigelow.* Plant 1–2 feet high. Lower part of the stem slightly pubescent. Leaves in pairs, unequal in size, the larger an inch long and half an inch or more broad. Perianth nearly half an inch in diameter with scarcely any free tube, purple. Stamens and style much exserted. Fruit a line and a half long. Near B. linearifolia, but that is glandularly viscid or villous, the leaves are usually much narrower and hispid on the margin, and the costæ of the fruit are thick and rounded. Dr. Parry collected at the Presidio incomplete specimens of another Boerhaavia, which may be undescribed. It differs from B. anisophylla in the much larger and more diffused panicle, smaller flowers, which are mostly solitary at the extremity of the branchlets, the hispid tube of the perianth, and the hairy fruit.

BOERHAAVIA SPICATA, (*Choisy, l. c. p.* 456?): caulibus e radice annua erectis minute pubescentibus; foliis ovatis sæpius obtusis integris repando-dentatis v. undulatis, inferioribus subcordatis; paniculæ ramulis in racemis sparsifloris desinentibus; bracteis bracteolisque lanceolatis cuspidatis; floribus (minutis) triandris; fructibus cylindraceo-clavatis glabris obtuse 5-costatis apice rotundatis. Ravines and damp sandy places. Presidio del Norte; *Parry, Bigelow.* Chihuahua; *Thurber.* Valley of the Gila; *Schott;* May—September. Plant 12–18 inches high, slender, the stem somewhat viscous. Leaves an inch long, on conspicuous petioles, often dotted. Racemes when in flower scarcely half an inch long, but in fruit 1–2 inches. Flowers scarcely a line in

diameter, on very short pedicels. Fruit 1½ line long. This seems to be the same as No. 1425 (which is without leaves) of Coulter's Mexican Collection; but B. spicata, as described by Choisy, differs in the lanceolate acute leaves and in some other unimportant characters.

BOERHAAVIA SCANDENS, *Linn.; Choisy, l. c.* B. Grahami, *Gray, l. c.* Dry ravines near the Cibola of the Rio Grande, August; *Bigelow.* El Podrero, Sonora, June; *Schott.* (No. 3204 and 3205, *Berlandier.*) We can discover no essential difference between B. Grahami and our West Indian specimens of B. scandens. Indeed, Dr. Gray suspected they were not distinct. The free portion of the calyx-tube is as short in the latter as in the former, and neither plant is climbing, being only prostrate, or not unfrequently even erect; so that the specific name is inappropriate.

BOERHAAVIA ERIOSOLENA, *Gray, l. c. p.* 322. Gravelly plains near Presidio del Norte, and below the Great Cañon of the Rio Grande, September; *Parry, Bigelow.* Annual. Plant 1–2 feet high. Leaves orbicular-cordate, 1½–2½ inches in diameter. Flowers often precociously fructified, and then the somewhat persistent tube becomes more or less elongated, sometimes 5–8 lines or more; but the limb, in such cases, does not expand.

BOERHAAVIA LEIOSOLENA (n. sp.): perennis; caule glabro erecto superne nudo; foliis rotundato-cordatis carnosis utrinque elevato-punctatis margine crenato-denticulatis glandulosisque; paniculæ ramis distantibus pauciforis, pedicellis subfasciculatis brevissimis; bracteis bracteolisque minutis; perianthii tubo elongato glabro; fructu turbinato 10-striato; staminibus 5. In gypseous soil, Great Cañon of the Rio Grande, 70 miles below El Paso, June; *Parry.* Stem 2–3 feet high, arising from a somewhat ligneous root. Leaves 2–3 pairs, near the base of the stem, 2–3 inches in diameter, roughened on both sides, (at least in dry specimens,) with little elevated dots or papillæ, and the upper surface somewhat flocculose-pubescent. Panicle naked or with only a pair of small leaves at the base of the lowest branches. Flowers somewhat fasciculate toward the summit of the branchlets. Perianth with the free portion of the tube nearly an inch long, the limb ovate but scarcely expanded in any of our specimens; the adherent portion of the tube expanded at the summit into an annulate narrow wing. Fruit about 2½ lines long, turbinate, crowned with a conical summit. This is evidently allied to the last species, and is a very remarkable plant.

BOERHAAVIA GIBBOSA, *Pavon.; Gray, l. c. p.* 323. Tinantia gypsophiloides, *Mart. & Gal.; Choisy, l. c. p.* 457. Borders of the Rio Grande, from El Paso to the mouth of the Pecos, and south-westward, April—October.

My friend Dr. Gray, who has lately revised the North American genera of Nyctaginaceæ and the species of Mirabilis and Oxybaphus, has furnished me with the following conspectus.

J. T.

1. MIRABILEÆ. Involucrum calyciforme, gamophyllum, 1–12-florum. Stigma capitatum, granulatum.

* Anthocarpium symmetricum, apterum. Involucrum 5-fidum.

MIRABILIS, *Linn.* Anthocarpium læve, haud angulatum, ecostatum aut vix costatum, ovoideum. Involucrum herbaceum, post anthesin vix mutatum. Stamina sæpissime 5.

OXYBAPHUS, *L'Her.* Anthocarpium 5-costatum, obovatum vel clavatum, costis validis. Involucrum post anthesin auctum, rotato-explanatum, scariosum, reticulatum. Stamina sæpissime 3.

** Anthocarpium læve, hinc excavatum, marginibus alæformibus rigidis plerumque dentatis

inflexis, in centro linea duplici tuberculorum. Involucrum tripartitum, triflorum, fructiferum haud scarioso-explanatum.

ALLIONIA, *Linn.* pro parte, *Choisy.* (This genus should: by right, have borne the name of Wedelia, *Lœfl.*, and Oxybaphus that of Allionia, *Lœfl.*) Although the number of parts in the involucre may well be more important than the number of flowers it incloses as Choisy remarks, yet the principal character of Allionia is in the fruit.

2. ABRONIEÆ. Involucrum polyphyllum, perfectum, e bracteis discretis 5–15, capitulum multiflorum fulcrans. Stigma capitatum vel lineari-clavatum.

NYCTAGINIA, *Choisy.* Perigonium tubuloso-infundibuliforme, lobis integris. Genitalia longe exserta. Anthocarpium nuciforme Mirabilis, ecostatum.

ABRONIA, *Juss.* Perigonium hypocraterimorphum, lobis obcordatis. Genitalia inclusa. Anthrocarpium perfectum 5-peterum. Embryo abortu monocotyledoneus.

3. ACLEISANTHEÆ. Involucrum imperfectum, e bracteolis 2–3 parvis ad flores singulos, vel nullum. Stigma læve, peltatum seu pileiforme.

SELINOCARPUS, *Gray.* Anthocarpium alatum, alis 5 vel abortu 3 aveniis.

ACLEISANTHES, *Gray.* Anthocarpium et perigonium (longe tubulosum) Mirabilis.

PENTACROPHYS, *Gray.* Anthocarpium cylindricum, 5-costatum, costis apice glandula sæpius tumida instructis.

BŒRHAAVIA. Anthocarpium nunc 5-costatum vel angulatum, nunc 10-costatum. Flores sæpius paniculati vel racemosi.

MIRABILIS, *Linn.*

§ 1. NYCTAGE, *Royen.* Involucrum uniflorum. Perigonium longe tubulosum vel infundibuliforme. Flores ampli.

M. JALAPA & M. LONGIFLORA, *Linn.*, cum variis.

§ 2. QUAMOCLIDION, *Choisy.* Fere præcedentis, sed involucrum 3–12-florum.

M. TRIFLORA, *Benth. Pl. Hartw.* Quamoclidion nyctagineum, *Choisy.*

M. MULTIFLORA. Oxybaphus multiflorus, *Torr.* Quamoclidion multiflorum, *Torr.*, etc.

§ 3. OXYBAPHOIDES. Involucrum 1–3-florum. Perigonium e tubo brevi late infundibuliforme. Flores pro genere parvi.

M. OXYBAPHOIDES. Quamoclidion oxybaphoides, *Gray in Sill. Jour.* (*ser.* 2,) 15, *p.* 320. Involucrum triflorum, 5-partitum, fructiferum tenui-membranaceum. Stam. 3.

M. CALIFORNICA. Oxybaphus lævis, *Benth. Bot. Voy. Sulph. p.* 44? O. glabrifolius, var. crassifolius, *Choisy in DC. Prodr.* 13, *p.* 431. O. glabrifolius, *Torr. Bot. Whipp. Rep. p.* 131, non *Vahl.* Aut glabra, aut viscoso-villosa, foliis parvis subcordatis. Involucrum uniflorum, 5-fidum. Stam. plerumque 5. (This cannot be Oxybaphus ovatus, which is said to have "semen obovatum læve," for it is also said to have the involucrum "crescentes in membranam venoso-reticulatam patentissimam." *R. & P.*)

OXYBAPHUS.

The two sections founded on the number of the flowers in the involucre are of small value in this genus. Betero's No. 495, referred by Choisy to O. ovatus, and probably (with Calyxhymenia ovata, *R. & P.*?) only a form of O. viscosus, exhibits two if not three flowers in the same involucre. No. 511 of Dr. Gregg's Mexican Collection is in the same case, and is pretty clearly O. viscosus notwithstanding. And I think that Wright's No. 605, with glabrous and papillose-

tuberculate fruit, is only a similar state of O. glabrifolius. The 3-flowered species occasionally bear four or five flowers.

Our species are exceedingly variable, and hard to fix by characters. The tubercles or papillæ develope variously in the same species, and they also change after wetting, deliquescing more or less into mucilage. The earlier flowers of O. nyctagineus, and probably of other species, are apt to fructify precociously.

I can understand our species only as follows:

§ 1. Perigonium breve, subcampanulatum seu rotato-infundibuliforme, involucrum paullo superans.

* Anthocarpium glabrum secus vel etiam inter costas sæpissime tuberculatum. Involucrum 1–3-florum.

O. VISCOSUS et O. GLABRIFOLIUS, Mexico.

O. GLABRIFOLIUS. *Vahl.*: var. involucro 2–3-flora. Texas, in mountain valleys near the Rio Grande, below El Paso; No. 605, *Wright.*

O. AGGREGATUS, *Vahl.* Mirabilis aggregata, *Cav. Ic.* 5, *t.* 437. Smith's Run, western Texas; No. 1717, *Wright.* Certainly the plant of Cavanilles, and found north of Mexico by no other collector.

** Anthocarpium pubescens. Involucrum semper 3–5-florum.

O. NYCTAGINEUS, *Sweet.* Allionia nyctaginea, *Michx. Fl.* 1, *p.* 100. Folia omnia (nisi summa diminuta) petiolata, basi obtusa vel cordata. Fructus hirsutulus, inter costas nunc leviter subreticulato-rugosus.

Var. α LATIFOLIUS: usque ad involucrum fere glaber seu glaberrimus; foliis ovatis cordatisve submembranaceis, facie Mirabilis. Allionia nyctaginea, *Michx.* Wisconsin to Texas and New Mexico. No. 741, *Fendler;* 603, *Wright;* 681, (1847–8,) *Lindheimer,* &c. This needs to be compared with O. violaceus, a Linnæan species, of which I have no sufficient specimens.

Var. β CERVANTESII: ramulis involucrisque viscoso-pubescentibus seu villosis; foliis plurisque minoribus et crassioribus sæpius obtusis cordatis vel basi subcordatis. O. Cervantesii, *Lag. ex Choisy, l. c.* New Mexico and Texas to Mexico. No. 912, *Coulter;* 742, *Fendler;* 1719 and 1720, *Wright.* No. 1719, in part, and 1721, *Wright,* an intermediate between α and β.

Var. γ OBLONGIFOLIUS: foliis ovato-lanceolatis oblongisve crassis basi haud cordatis; cæt. var. β. Allionia ovata, *Pursh, Fl.* 1, *p.* 97. Oxybaphus floribundus, *Choisy, l. c.* A mere form of the last. No. 604, *Wright;* 2004, *Berlandier,* &c.

Var. ε PILOSUS: undique viscoso-hirsutus; cæt. var. β & γ. Calymenia pilosa, *Nutt. Gen.* 1, *p.* 26. Upper Missouri to New Mexico. No. 1718, *Wright;* between this and var. β. Rio Mimbres, &c.; *Bigelow.*

O. ALBIDUS, *Sweet; Choisy, l. c.* Allionia albida, *Walt. Fl. Car. p.* 84. Calymenia albida, *Nutt.* Oxyb. pilosa? *Engelm. & Gray, Pl. Lindh. l. c. p.* 51. Præter inflorescentia glabella. Folia omnia subsessilia, lanceolata seu oblongo-lanceolata, basi acuta. Fructus magis hirsutus quam in O. nyctagineo, secus vel inter costas muriculatus. North Carolina to Texas. *Hook. Fl. Bot. Am.* 2, *p.* 124.

O. HIRSUTUS, *Sweet; Choisy, l. c.* Allionia hirsuta, *Pursh, Fl.* 2, *p.* 728. Calymenia hirsuta, *Nutt. l. c.* Saskatchewan to northwestern Texas; on the Limpio; *Bigelow, Wright.* Subpedalis, undique hirsutus. Folia lanceolata, crassa, inferiora breviter petiolata. Fructus O. nyctaginei. The broader-leaved states approach var. ε of O. nyctagineus; the narrow ones becoming glabrate may pass into the next species.

O. ANGUSTIFOLIUS, *Sweet; Choisy, l. c.* (pro parte.) Colymenia angustifolia, *Nutt.* C. decumbens, *Nutt.* Allionia linearis, *Pursh, l. c.* Folia linearia, sæpius elongata, repanda, crassa, glaucescentia, cum caule 1–6 pedali glaberrima. Pedunculi et involucra pubescentia. Fructus cinereo-pubescens. Upper Missouri to the Rocky mountains, New Mexico, and Texas. No. 745, *Fendler;* 606, 607, 1822, *Wright.*

§ 2. Perigonium angustius infundibuliforme, involucro quadruplo longius. Anthocarpium clavato-oblongum, apiculatum, pubescens, inter costas validas profunde sulcatum.

O. COCCINEUS, *Torr. ined.* Species habitu præcedentis, floribus et fructu distinctissimum. New Mexico.

POLYGONACEÆ.

ERIOGONUM HIERACIFÒLIUM, *Benth. in DC. Prodr.* 14, *pars* 1, *p.* 6. Hillsides, along the cañons of Rio Grande, above the mouth of the Pecos; *Parry.* Western Texas, near the Rio Grande; *Wright*, No. 616. A well-marked species, but allied to E. alatum, from which it is easily distinguished by the achenium being winged only above the middle, and not at all below. It is commonly about a foot and a half or two feet high. The sepals are nearly equal, and vary from yellowish to rose color. Pedicels articulated close to the flower. Bracteoles linear, glabrous. Embyro excentric and a little curved.

ERIOGONUM ALATUM, *Torr. in Sitgreave Rep. p.* 168, *t.* 8; *Benth. l. c.* Hills near the Copper Mines, New Mexico; also near Cruces, June—July; *Bigelow, Thurber,* (No. 225.) Some of the specimens are more than four feet high.

ERIOGONUM CILIATUM (*Torr.*; *Benth. l. c.*): herbaceum, perenne; caule nudo tereti glabro parce dichotomo-ramoso; foliis radicalibus obovatis obtusis cum acumine brevissimo basi in petiolum attenuatis supra glabris, subtus pilosiusculis margine ciliatis; pedunculis elongatis; involucris campanulatis 5-fidis; perigoniis subcoriaceis semisexfidis, laciniis ovatis erectis, interioribus paullo longioribus angustioribusque; achenio triquetro perigonio fructifero subæquali. Sandy soil near Buena Vista, Cohahuila, July; *Dr. Edwards.* Near Monterey, in the same State; *Gregg.* Root perennial; leaves in a subradical cluster from a short divided caudex, 1½ to 2½ inches long (including the petiole) and six to ten lines wide. Stems, several from one root, 12–15 inches high, slender, two to three times forked, the terminal divisions bearing a solitary involucre which is about two lines in diameter. Flowers very numerous, the pedicels jointed close to the flower. Bracteoles narrowly linear, fringed with long hairs. Perianth purple, of a coriaceous (or probably, in the living plant, of a fleshy) texture; the segments extending scarcely below the middle, rather obtuse; the entire base showing six obtuse ridges. Stamens included, six of them alternating with the segments, the other three opposite the inner segments and inserted considerably lower down; filaments smooth. Ovary triangular; styles very short. Achenium enclosed in the connivent perianth, triquetrous, smooth. Embryo incurved, excentric. On high plains near San Juan de la Vagueria, Dr. Gregg found an Eriogonum that seems to be a variety of this species, but it differs in the following characters: var. FOLIOSUM: caule scabriusculo 2–3-chotome ramoso, axillis foliosis. Plant about a foot high, more branched than the preceding; the radical leaves smaller, less ciliate, and of a somewhat fleshy texture. Cauline leaves about three quarters of an inch long; smooth. Peduncles one to one and a half inch long. Sepals united to the middle, closing around the fruit.

ERIOGONUM LONGIFOLIUM, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 164; *Benth. l. c.* Mountains and plains near Live Oak Creek, September; *Bigelow.*

ERIOGONUM JAMESII, *Benth. l. c.* Hill sides and arroyas on the upper Rio Grande and its tributaries.

ERIOGONUM FASCICULATUM, *Benth. in Linn. Trans.* 17, *p.* 411, *& in DC. Prodr. l. c.* Near San Felipe, etc., California; *Parry, Schott.*

ERIOGONUM POLIFOLIUM, *Benth. in DC. Prodr. l. c.* Sandy hills, San Felipe; *Thurber*, (No. 587,) and near San Diego, California; *Parry.* Dr. Andrews found it also at Monterey. On the lower Gila; *Schott.* This species forms bushy tufts one to two feet in diameter.

ERIOGONUM WRIGHTII, *Torr.; Benth. l. c. p.* 15. Hill sides, Copper Mines, and along the Rio Grande from Albuquerque to the great cañons; frequent. Dry plains, Los Playas, Sonora, June; *Thurber.* Var. HELIANTHEMIFOLIUM. E. helianthemifolium, *Benth. l. c.* Pine mountains east of San Luis Rey, California; *Parry.*

ERIOGONUM VIRGATUM, *Benth. in DC. Prodr. l. c. p.* 16. Grassy places near San Luis Rey, California; *Parry.* This agrees very well with the original specimens of Frémont, named by Bentham.

ERIOGONUM GRACILE, *Benth. Bot. Sulph. p.* 46. Sandy ravines, Sonora, September; *Thurber.*

ERIOGONUM ACETOSELLOIDES, *Torr.; Benth. in DC. Prodr. l. c. p.* 16?. Near Santa Barbara, California, August; *Parry.* The flowers are smaller and on longer pedicels than in specimens collected in the United States Exploring Expedition.

ERIOGONUM VIMINEUM, *Dougl.; Benth. in Trans. Lin. Soc.* 17, *p.* 416. Sandy hills, San Felipe, California, May; *Thurber.*

ERIOGONUM MULTIFLORUM, *Benth. l. c.* Western Texas, along the lower Rio Grande to its mouth.

ERIOGONUM ANNUUM, *Nutt. l. c.; Benth. in DC. Prodr. l. c. p.* 19. E. cymosum, *Benth. l. c.* Alluvions of the Cibolo, a tributary of the Rio Grande, and rocky places, Howard's Springs, August—September; *Bigelow.*

ERIOGONUM TENELLUM, *Torr. in Ann. Lyc. New York*, 2, *p.* 241; *Benth. l. c.* Mountains below San Elcearío, and at the mouth of the Great Cañon of the Rio Grande; *Bigelow, Parry;* also on the San Pedro, western Texas. (Nos. 619 and 1767, *Wright.*) Some of our specimens are two feet high.

Var. β PLATYPHYLLUM. E. platyphyllum, *Torr.; Benth. l. c.* On the Rio Grande, western Texas. (Nos. 618 and 1768, *Wright.*) Intermediate forms show a gradual transition from this variety to E. tenellum.

ERIOGONUM TRICHOPODUM, *Torr.; Benth. l. c.* Dry ravines and rocky banks, along the Rio Grande from El Paso to the Great Cañon, and west to the Colorado of California. The leaves are all radical, orbicular, or roundish-ovate, cordate, on petioles much longer than the lamina.

ERIOGONUM CORDATUM, *Torr.; Benth. l. c.* Near San Felipe, on the borders of the California desert; *Parry.*

ERIOGONUM THURBERI (n. sp.): annuum, humile, arachnoideo-lanosum; foliis subradicalibus longe petiolatis late ovatis obtusis subcordatis rugosis, margine subundulatis, subtus incano-tomentosis; caule superne divaricato 2–3-chotomo; pedunculis elongatis capillaribus; involucris late campanulatis 5–6-fidis paucifloris; perigoniis glabris profunde 6-fidis, laciniis exterioribus superne reniformi-dilatatis medio constrictis; interioribus oblongo-subpanduriformibus. Sandy ravines, San Pasqual, California, May; *Thurber.* I have seen specimens of this plant collected in California by Mr. Wallace. Leaves in a subradical cluster, about half an inch long undulate-rugose, pubescent above, white-tomentose underneath. Stem a scape about a span high tricho-

tomously subdivided below the middle, with ovate acute ternate bracts at the forks. Pedicels an inch long. Involucre less than a line in diameter, cleft nearly to the middle into six rather obtuse lobes; exterior segments of the perianth nearly four times broader than the inner. Filaments and ovary smooth. Styles short. Achenium smooth. Embryo strongly curved. No bracteoles were detected; in their place are only woolly hairs. Resembles E. rotundifolium in the flowers; but that species has numeous stems, which branch near the root, even leaves; much shorter stout peduncles, and manifest bracteoles.

ERIOGONUM ROTUNDIFOLIUM, *Benth. l. c.* Rocky ravines along the Rio Grande from El Paso to Santa Barbara, and west to Santa Maria, Cohahuila, April—June. (No. 1765, *Wright.*)

ERIOGONUM CERNUUM, *Nutt. Pl. Gamb. in Jour. Acad. Sc. Phil. n. ser.* 1, *p.* 162; *Benth. l. c.* On the Gila; *Schott.*

ERIOGONUM ABERTIANUM, *Torr. in Emory's Rep. p.* 151; *Benth. l. c.* Sandy soils, valley of the upper Rio Grande; westward along the Gila, and in Chihuahua. Variable in height and breadth of leaves, but always easily recognized. (Nos. 620, 621, 622, 1761, 1762, 1763, *Wright.*)

ERIOGONUM PHARNACEOIDES, *Torr. in Sitgreave's Rep. p.* 167, *t.* 11; *Benth. l. c.* Hills near the Copper Mines; *Bigelow.* Near Janos, Chihuahua; *Thurber.*

CHORIZANTHE ANGUSTIFOLIA, *Nutt. l. c.*; *Benth. l. c.* Near Monterey, California, on the sandy beach, May; *Parry.*

CHORIZANTHE DIFFUSA, *Benth. Pl. Hartw. p.* 333, *& in DC. Prodr. l. c.* With the last; *Parry.*

CHORIZANTHE PROCUMBENS, *Nutt. l. c.; Benth. l. c.* San Diego, California, May; *Thurber.*

CHORIZANTHE BREVICORNU (n. sp.): annua; foliis radicalibus anguste-spathulatis hirsutis; caulibus subnudis erectis 2–3-chotome ramosis; cymis laxe corymboso-paniculatis; involucris glabriusculis anguste tubulosis, dentibus subæqualibus subulato-aristatis recurvis tubo triplo-brevioribus, perigonii laciniis integris acutiusculis æqualibus. On the Gila River, *March; Parry,;* also collected by Colonel Frémont on the same river. Plant 1–4 inches high. Leaves scarcely a line wide, rather acute. Bracts subulate. Involucre about 3 lines long, a little curved, the teeth scarcely uncinate. Stamens only 3 in all the specimens examined. Near C. staticoides, but with a much looser inflorescence, shorter involucral teeth, equal perianth-segments and only 3 stamens.

CHORIZANTHE FIMBRIATA, *Nutt. l. c.; Benth. l. c. Torr. in Pacif. R. Road Expl.* 6, *p.* 362, *t.* 8. "Dry hills around San Diego, California, in such profusion as to give them a red appearance;" *Thurber.*

ACANTHOGONUM RIGIDUM, *Torr. in Bot. Whippl. Rep. p.* 133, *& in Bot. Parke's Rep. t.* 8. Desert west of the Colorado, California, March; *Schott.*

MUCRONEA CALIFORNICA, *Benth. in Linn. Trans.* 17, *p.* 419, *t.* 20, *& in DC. l. c. p.* 27. Dry hills near San Diego, California; *Parry.* In our specimens the involucres are all 3–4-toothed.

CENTROSTEGIA THURBERI, *Gray, in DC. Prodr. l. c. p.* 27; *Torr. in Bot. Parke's Rep.* 7, *p.* 19, *t.* 8. Sandy hills near San Felipe, California, May; *Thurber, Antisell.*

PTEROSTEGIA DRYMARIOIDES, *Fisch. & Mey. Ind.* 2, *Sem. Hort. Petrop. p.* 48; *Benth. l. c.* San Pasqual, and Napa, California, May; *Thurber.* Mr. Thurber's specimens from Napa resemble those collected by Dr. Bigelow near San Gabriel, in which the leaves are 2-cleft with variously cut segments.

RUMEX HYMENOSEPALUS (n. sp.): glaberrimus; foliis ovato-lanceolatis basi angustatis margine subundulatis; panicula aphylla, racemis elongatis erectis, verticillis approximatis multifloris;

pedicellis capillaribus valvas sequantibus; valvis lato-cordatis membranaceis integerrimis ecallosis. Sandy soils from El Paso to the cañons of the Rio Grande; March—April. Root white. Stem 2–3 feet high. "Foliage intensely bitter;" *Thurber*. Lower leaves a foot or more long and 2–3 inches wide, somewhat undulate on the margin; upper ones nearly flat. Panicle a foot long; the flowers crowded. Inner sepals of the fructiferous calyx nearly half an inch long, roundish-ovate, strongly cordate, of a very thin texture, often rose-colored, slightly reticulate-veined, twice as long as the achenium. We cannot refer Rumex to any described species. It is nearest R. venosus, but that is a smaller plant, the leaves with a much longer and more attenuated base, the panicle lax, and with but few flowers in whorls, and the valves are a great deal larger, as well as broader in proportion.

RUMEX SALICIFOLIUS, *Weinm. in Flora*, 1821, *ex Meisn. in DC. Prodr.* 14, *pars* 1, *p.* 47. Banks of the Rio Grande near Frontera, Texas; April. (No. 1780 and 1781, *Wright.*)

Var. DENTICULATIUS: valvulis lato-deltoideis denticulato-serrulatis vix callosis. Near San Diego, California; *Thurber*. Probably a distinct species.

RUMEX MARITIMUS, *Linn.; Meisn. l. c. p.* 59. Moist sandy places near San Luis Rey, Calfornia; *Parry*.

POLYGONUM AVICULARE, *Linn. Sp. p.* 519; *Meisn. l. c. p.* 97. Western Texas; *Wright*, No. 1774 and 1775; the latter a tall erect slender form with narrowly lanceolate leaves.

POLYGONUM PARONYCHIA, *Cham. & Schlecht. in Linnæa*, 3, *p.* 51. *Meisn. l. c. p.* 89. Near Monterey, California; on the sea beach, April; *Parry*. San Francisco, March; *Thurber*.

POLYGONUM CAMPORUM, γ BOREALE, *Meisn. in Mart. Fl. Bras. fasc.* 14, *Polyg. p.* 22; *& in DC. Prodr.* 14, *pars* 1, *p.* 87. Dry bed of the Sea Willow, Texas, August; *Bigelow*. Mouth of Los Moros; *Schott*. (No. 614, *Wright.*) Stems 3–4 feet long, simple below, apparently arising from a creeping rhizoma, the branches elongated, terete, terminating in long slender interrupted spikes; bracts 2–4-flowered, the lower ones remote and sometimes with small oblong leaves in the axils, the upper somewhat approximated. Flowers on exserted pedicels. Perianth pale rose color or white, not punctate. Achenium triquetrous.—Allied to P. scoparium of Corsica.

POLYGONUM TENUE, *Michx. Fl.* 1, *p.* 238; *Torr. Fl. N. York*, 2, *p.* 153. Hill sides, Santa Rita del Cobra, Aug.; *Bigelow*. (No. 1776, *Wright.*)

POLYGONUM ACRE, *H. B. K.; Meisn. l. c. p.* 107. P. hydropiperoides, *Pursh*, non *Michx*. Between El Paso and Doña Ana, on the Rio Grande, April; also on the Mimbres; *Bigelow*. (No. 1777, *Wright.*)

POLYGONUM HYDROPIPEROIDES, *Michx. Fl.* 1, *p.* 239; *Meisn. l. c. p.* 103. Brady's Creek, western Texas, October; *Thurber*.

POLYGONUM NODOSUM, *Pers.* var. INCARNATUM, *Gray, Bot. N. States, ed.* 2, *p.* 372. P. incarnatum, *Ell.* With the last. Wet ravines below San Elçeario on the Rio Grande; *Bigelow*. Western Texas; *Thurber*.

POLYGONUM PENNSYLVANICUM, *Linn. Sp.* 1, *p.* 519; *Meisn. l. c.* Low grounds near San Elceario Texas; *Bigelow*. Sonora; *Thurber, Capt. E. K. Smith*.

POLYGONUM PERSICARIA, *Linn.; Meisn. l. c.* Wet places; Valley of the Limpio, etc.

POLYGONUM AMPHIBIUM, *Linn.; Meisn. l. c.* Var. TERRESTRE. Presidio del Norte; *Bigelow* (a nearly glabrous form.) Santa Cruz river, Sonora; *Capt. E. K. Smith*. (No. 1779, *Wright.*

BASELLACEÆ.

ANREDERA SCANDENS, *Moq. in DC. Prodr.* 13, *pars* 2, *p.* 230. Basella vesicaria, *Lam. Dict.* 1, *p.* 382. Alluvions of the lower Rio Grande, below Roma, September—October; *Schott.* A very common vine in the thorny "chapparal," twining profusely on every fence and hedge near Corpus Christi; *Dr. Edwards.*

AMARANTACEÆ.

ACANTHOCHITON WRIGHTII, *Torr. Bot. Sitgr. Rep. p.* 170, *t.* 13. Plains among the Burro mountains, September; *Bigelow.* Los Medanos, Chihuahua, August; *Thurber.* These specimens are very perfect and enable us to amend the character of Acanthochiton given in the work here quoted. There are three somewhat unequal bracts to each male flower. The cells of the anthers are separate at the summit, and very acute. The female flowers are mostly ternate and are subtended by three bracts, the middle one of which is cordate-falciform and usually much larger than the lateral ones.

CELOSIA PANICULATA, *Linn. Sp. p.* 298; *Moq. in DC. Prodr.* 13, 2, *p.* 240. Shady woods near Eagle Pass, on the Rio Grande; also on the San Pedro river, western Texas, August—November; *Bigelow.* (No. 594, *Wright.*) A common plant in subtropical America. Dr. Edwards found it at Corpus Christi, and Mr. Blodgett at Key West.

AMARANTUS HYBRIDUS, *Linn. Sp. p.* 1406; *Moq. l. c. p.* 259. On the Rio Grande, and along the Gila. (No. 1648, *Wright.*) Probably not indigenous.

AMARANTUS BLITUM, *Linn. l. c.; Moq. l. c.* Low places, near Camp Bache, July; *Bigelow.* Introduced from Europe?

SARRATIA BERLANDIERI, *Moq. l. c. p.* 268. Mountains of the Cibola, a tributary of the Rio Grande, August; *Bigelow* Our specimens are about 18 inches high, which is three times taller than Berlandier's plant, as described by Moquin.

SARRATIA BERLANDIERI, var. EMARGINATA: foliis oblongo-lanceolatis; calycis fœminei lacinis lato-cuneatis, emarginatis. Camp Green, October; *Parry.* This variety is about a foot high. Except in the laciniæ of the perianth, it does not appear to differ from the preceding.

SARRATIA BERLANDIERI, var. DENTICULATA: foliis lineari-lanceolatis, calycis fœminei laciniis lato-cuneatis margine eroso-denticulatis. Santa Cruz, Sonora, September; *Thurber.*

SARRATIA BERLANDIERI, var. FIMBRIATA: foliis linearibus; glomerulis subglobosis densifloris, inferioribus axillaribus superioribus approximatis subspicatis; calycis fœminei laciniis æqualibus flabellato-cuneiformibus apice dentato-fimbriatis. On the Gila river; *Schott.* (No. 582, *Wright.*) Stem 2 feet or more in length, smooth, branching; the branches erect. Leaves 1½–2½ inches long, 1½–2 lines wide, smooth, tapering at the base. Glomerules of flowers about one-third of an inch in diameter, the upper ones aggregated in a long naked spike. Bracts subulate. Perianth parted nearly to the base; the segments spreading, mostly broader than long, abruptly narrowed to a short claw, the summit cut into irregular acute teeth or laciniæ. Ovary globose ovate; stigmas 3–4. Utricle tubercular-rugous at the summit. Seed lenticular, acute on the margin, smooth, and shining. This appears to be quite a distinct species.

AMBLOGYNA POLYGONOIDES, *Raf.; Moq. l c. p.* 270. Amarantus polygonoides, *Linn.* Western Texas, (No. 1746, *Wright.*) We have it also from Dr. Gregg, who collected it at Cerro Alto, Mexico. The genus Scleropus, of Schrader, is founded on an abnormal state of this plant, in which the peduncles and pedicels have become thickened and indurated. We have it in this

state from Key West, collected by Mr. Blodgett, and from the vicinity of New Orleans, where it was found by Dr. Riddell. Even some of Berlandier's specimens, which Moquin referred to Scleropus, are in the ordinary state of Amblogyna polygonoides.

MONTELIA TAMARISCINA, *Gray, Man. Bot. ed.* 2, *p.* 370. Amarantus tamariscinus, *Nutt. in Trans. Amer. Phil. Soc.* (*n ser.*) 5, *p.* 165. Ravines Rio San Pedro, western Texas, September; *Bigelow*, who collected only the male plant; while Wright (under No. 1747) has both sexes.

GUILLEMINEA DENSA, *Moq. l. c. p.* 338. Plains between the Limpio and the Rio Grande; also near the Copper Mines, July—August; *Bigelow*. Sonora; *Thurber*. On the banks of the Colorado, California; *Schott*. (Nos. 584, 585, and 1755, *Wright*.) Mr. Thurber's plant exactly accords with the description of Moquin, l. c.; but our specimens from the other collections have broader leaves.

GOSSIPIANTHUS RIGIDIFLORUS, *Hook. Ic. Pl.* 3, *t.* 251; *Moq. l. c. p.* 337. Western Texas. (*Wright*, Nos. 586 and 1754.) This plant occurs only in the collections of Mr. Wright. It is certainly the same as Drummond's, on which the species was founded. We have no original specimens of G. tenuiflorus for comparison, but we believe that it is not distinct from G. rigidiflorus. In our Drummondian specimens of the latter, the plant is in fruit and the stamens are withered. In the more complete ones of Mr. Wright the filaments are ovate-lanceolate, as they are described in G. tenuiflorus; and in both they are connate at the base. The relative length of the bracts and calyx depends on the age of the flower.

IRESINE VERMICULARIS, *Moq. l. c. p.* 340. Illecebrum vermiculatum, *Linn.* Lower Rio Grande, in alluvial soils, October, *Schott*.

IRESINE DIFFUSA, *Humb. & Bonpl. in Willd. Sp.* 4, *p.* 765; *Moq. l. c. p.* 345. Var. foliis ovato-oblongis; spiculis oblongis; calyce bracteis subduplo longiore; staminodiis subulatis staminibus alternantibus et triplo-brevioribus. Sonora and Chihuahua; *Thurber*. San Estaban, September; *Bigelow*. On the Rio Grande, near the Great Cañon; *Parry*. Perhaps not distinct from I. celosioides, to which, indeed, some other species of the section Iresinastrum might be referred; but we have not found staminodia in any other of this group.

All our specimens are female. No. 589, *Wright*, is the male plant, in which there are small subulate staminodia between the filaments; thus resembling Ireneis, of Moquin, a genus scarcely distinct from Iresine.

ALTERNANTHERA ACHYRANTHA, *R. Br. Prodr. p.* 417; *Moq. l. c. p.* 358. Achyranthes repens, *Linn.; Ell. Sk.* 1, *p.* 309. Banks of the Rio Pecos; *Schott*. Bachimba, Chihuahua; *Thurber*. Matamoras; *Gregg*. Moquin refers Elliott's plant to Telanthera polygonoides, but it certainly belongs here.

ALTERNANTHERA LANUGINOSA, *Torr. in Emory Rep. p.* 150; *Moq. l. c. p.* 359, (pro parte.) Achyranthes lanuginosa, *Nutt. in Amer. Phil. Trans.* (*n. ser.*) 5, *p.* 166. Common in New Mexico and Sonora, flowering through the summer. (Nos. 591 and 1756, *Wright;* Nos. 726 and 727, *Fendler;* Nos. 835 and 2255, *Berlandier*.) In Emory's Report I noticed a remarkable character in the specimens examined. The flowers become imbedded in the branches on which they grow, so that when in fruit they are partly or wholly concealed; on which account I proposed to call it Endotheca. This character is, however, not constant, or is only seen in old specimens. Sometimes the short branches, with the cluster of flowers at the summit subtended by two or three leaves, will assume the appearance of a pedunculate head, furnished with an involucre. The peduncle becomes thickened upward, as does likewise the confluent bases of the leaves, involving more or less the flowers. In the young state the plant is densely woolly with

verticillate hairs, but is nearly smooth later in the season. The staminodia are merely obtuse lobes between the filaments, or are wanting altogether. According to Mr. Schott the Mexicans use a decoction of this plant as tea.

ALTERNANTHERA? SUFFRUTICOSA (n.sp.): cinereo-pubescens; caule suffruticosa erecto? ramosissimo; foliis inferioribus ovatis breviter petiolatis, superioribus verticillatis subternatis suborbiculatis sessilibus; glomerulis paucifloris axillaribus sessilibus; sepalis oblongo-lanceolatis versus apicem pilosis bracteis duplo longioribus. Mountains near Frontera and between the Pecos and the Limpio; *Wright*, No. 592 and 1757. This species is truly suffruticose; the stems (which seem to grow erect,) arise from a thick irregular woody base. The A. lanuginosa is always annual and diffuse; the leaves are larger, with a long abruptly attenuated base, and the glomerules are fewer flowered.

GOMPHRENA TUBERIFERA (n. sp.:) parce pilosa; radice tuberosa; caule erecto ramoso herbaceo; foliis lanceolato-linearibus sessilibus integerrimis mucronulatis cinereis; pedunculis elongatis simplicibus; capitulis globosis vel ovatis solitariis plerumque diphyllis; floribus nitidulis alboroseis; calyce bracteis lateralibus subæquali; sepalis acutissimis uninerviis villosissimis. Rocky banks of the San Pedro and other tributaries of the Rio Grande, Western Texas and in New Mexico. (Nos. 593 and 1750, *Wright.*) Root fusiform, 1½–2 inches long and about one-third of an inch in diameter above, fleshy and farinaceous; stem 1–2 feet high, sparingly branched.

GOMPHRENA DECUMBENS, *Jacq; Moq. l. c. p.* 410. Lower Rio Grande, October; *Schott.* This agrees very well with specimens from Havana, named by Moquin.

GOMPHRENA GLOBOSA: var. ALBIFLORA, *Moq. l. c.* On the Cibola and other tributaries of the Rio Grande; *Bigelow, Schott.* Santa Cruz and Babocomori, Sonora, September; *Thurber.* (No. 1751, *Wright.*)

GOMPHRENA SONORÆ (n. sp.:) caulibus e basi lignosa ortis pilosis; foliis lanceolatis sessilibus pilosis pallide viridibus; capitulis terminalibus et lateralibus ovatis simplicibus vel 2–3 confluentibus 2–4-phyllis; floribus flavescenti-vel carneo-albidis; bracteis lateralibus dorso sursum angusto-cristatis calyce paullo longioribus, sepalis acutissimis uninerviis villosissimis; stylo ovario longitudine apice bifido. Mountains near Santa Cruz, Sonora, Mexico, September; *Wright*, (No. 1749,) *Thurber.* Stems simple or sparingly branched, slender, 1–2 feet high, sparingly clothed with appressed hairs. Leaves 1–1½ inch long, 3–5 lines wide, acute, the lower ones narrowed at the base. Axillary heads simple, sessile, about one third of an inch in diameter; terminal heads mostly composed of two or three closely aggregated smaller heads. Lateral bracts about one-fifth longer than the calyx, with a narrow serrated crest above the middle. Stamineal tube entire to the summit; antheriferous lobes very minute; the lateral ones liguliform, much shorter than the anthers. Style about as long as the ovary; stigmas cylindrical, acute, half as long as the style. This species occurs only in the collections of Wright and Thurber, and does not appear to have been hitherto described. It seems to be allied to G. agrestis, *Mart.*

GOMPHRENA CÆSPITOSA (n. sp.:) humilis; caulibus cæspitosis; caudice lignoso; foliis obovatis obtusis subsericeo-villosis, radicalibus basi attenuatis, caulinis binis subsessilibus; pedunculis brevibus simplicibus; capitulis terminalibus solitariis ovatis; floribus nitidis flavescenti-albis; calyce bracteis ecristulatis paullo longiore; sepalis obtusiusculis uninerviis villosissimis. Gravelly plains near the Organ mountains, New Mexico; also at the Copper Mines and near Mimbres, April—May; *Bigelow, Wright*, (No. 1572.) Cook's Springs, New Mexico; *Thurber.* Rio de Santa Cruz, &c., Sonora; *Schott, Capt. E. K. Smith* .No. 1753, Wright, is a glabrescent state of this species. Stem or rather caudex 1–2 inches long, thick and somewhat ligneous, throwing

up a tuft of spreading or decumbent branches, which are 1½–4 inches long, and, when young, are densely clothed with a whitish pubescence. Radical leaves an inch or more in length, exclusive of the petiole, which is about an inch long; in the young state pubescent, with almost silky white hairs, but finally smoothish; cauline leaves similar, but with very short petioles, or nearly sessile. Heads about three-fourths of an inch long. Bracts very acute, thin and hyaline, entirely without a keel. Sepals somewhat rigid, extremely villous. Filaments united nearly to the summit; the lateral processes often reduced to small teeth, or sometimes almost wanting. Style deeply bifid.

FRŒLICHIA FLORIDANA, *Moq. l. c. p.* 420. Oplotheca Floridana, *Nutt. Gen. p.* 79; *Bart. Fl. N. Amer. t.* 59. On the Limpio and near Van Horn's Wells; *Bigelow.* Presidio del Norte; *Parry.* May—July.

FRŒLICHIA DRUMMONDII, *Moq. l. c.* Rio Coleto and near El Paso; *Thurber.* Sandy beach of the lower Rio Grande, April; *Schott.* Too near the preceding species, which, again, seems to be scarcely distinct from F. interrupta.

FRŒLICHIA GRACILIS, *Moq. l. c.* Oplotheca gracilis, *Hook. Ic. sub t.* 256. Alluvions of the Rio Grande and at the Copper Mines, August—October; *Bigelow.* On the Guadalupe river, Texas; *Schott.* Chihuahua and Sonora; *Thurber.* A smaller species than the two preceding.

CHENOPODIACEÆ.

TELOXYS CORNUTA, *Torr. Bot. Whippl. Exped. p.* 129. Hills and rocky places near Santa Rita del Cobra, October, (in fruit;) *Bigelow.* Some of the specimens are nearly two feet high.

CHENOPODIUM ALBUM, *Linn; Moq. l. c. p.* 71. Doña Ana, New Mexico, Sonora and Chihuahua, April—July; *Thurber.* (Nos. 1731 and 1732, *Wright.*)

CHENOPODIUM ANTHELMINTICUM, *Linn.; Moq. in DC. Prodr.* 13, *pars* 2, *p.* 73. Various places New Mexico and western Texas; probably introduced.

BLITUM BONUS-HENRICUS, *Reich.; Moq. in DC. l. c. p.* 68. In fertile grassy places near San Luis Rey; *Parry;* and near San Diego, California; *Thurber.* Doubtless introduced from Europe.

OBIONE CANESCENS, *Moq. in DC. Prodr.* 13, *pars* 2, *p.* 212. Abundant at the foot of San Diego Bay, California; *Parry.* It forms dense thickets, 3–5 feet high.

OBIONE HYMENELYTRA (*Torr. in Bot. Whippl. Exped. p.*129, *t.* 20): caule fruticoso ramosissimo, ramis inermibus teretibus; foliis subdeltoideo-orbiculatis vel basi truncatis grosse acuteque dentatis dense lepidoto-incanis; floribus dioicis; bracteis reniformi-orbiculatis membranaceis integerrimis basi coalitis, disco nudo. Desert of the Colorado and on the Lower Gila, in saline soils; *Schott.* A shrub apparently 2–3 feet high, the branches very crooked and interlaced. Leaves 1–1½ inch in diameter, the margin cut into coarse, more or less acute salient teeth. Male flowers in dense glomerules, which are collected into axillary and terminal paniculate spikes. Fructiferous bracts more than one-third of an inch in diameter, reticulately veined, only united at the base, the short pedicel tumid and spongy.

OBIONE ARGENTEA, *Moq. Chenop.* 76, *& in DC. Prodr. l. c. p.* 115. Atriplex argentea, *Nutt. Gen.* 1, *p.* 198. Valley of the Pecos, September; *Bigelow.* Annual; stem much branched and at length diffuse, the branches angular and flexuous, nearly smooth. Leaves triangular or somewhat deltoid, subsessile, often nearly entire but usually more or less toothed, membranaceous. Male flowers in glomerated interrupted terminal spikes; female flowers in sessile axillary

clusters. Fructiferous bracts pedicellate, suborbicular, the margin acutely and often irregularly toothed, disk naked, or sometimes cristate with foliaceous appendages.

OBIONE CONFERTIFOLIA, *Torr. & Frém. in Frém. 2d Rep. p.* 318. Mountains near Laguna de Santa Maria, Chihuahua, April; *Bigelow.* Only the male plant was collected.

OBIONE RADIATA (n. sp.): caule erecto? herbaceo ramoso, ramis inermibus; foliis obovato-oblongis obtusissimis mucronulatis membranaceis integerrimis vel obsolete repando-dentatis basi attenuatis utrinque lepidotis canescentibus; glomerulis fœmineis axillaribus; bracteis sessilibus orbiculatis infra mediam coalitis margine radiatim denticulatis, disco inappendiculato carinulato. Alluvions of the Gila, Sonora, May; *Schott.* Stem apparently annual and about a span long; the branches flexuous. Leaves 8–12 lines long and 3–5 lines broad. Male flowers in small terminal spikes; female flowers in small axillary clusters. Fructiferous bracts almost exactly orbicular, very flat, 1½ line in diameter, neatly cut around the margin into very short acute teeth, the disk marked with a central, longitudinal, slightly prominent keel. We cannot identify this plant with any of the species of Obione described by Moquin; it is most nearly related to the following:

OBIONE ELEGANS, *Moq. l. c. p.* 113, var.? RADIATA. Rio Sta. Murin, Chihuahua, August; *Thurber.* Western Texas, (No. 571 and 1743.) We are not confident as to our determination of this plant. Our specimens are certainly annual; the leaves are rather obtuse than acute; the fructiferous bracts are scarcely pedicellate and they are united to the middle. The margin is cut into strong acute radiating teeth.

OBIONE ELEGANS, var.? TUBERCULOSA: foliis repando-denticulatis; bracteis orbiculatis, margine dentatis, disco tumido cartilagineo medio tuberculoso-dentatis. Western Texas; *Wright.* Plant about a foot high, apparently annual. Differs from the last, chiefly in the tumid fructiferous bracts, the disks of which, on each side of the median line, are furnished with 2–3 acute tubercles.

OBIONE ACANTHOCARPA (n. sp.): caule suffructicoso erecto ramoso, ramis subteretibus inermibus; foliis deltoideo-lanceolatis spathulatisve integris vel repando-dentatis densissime lepidotis incanis floribus dioicis; glomerulis interrupte spicatis, spicis masculis paniculatis terminalibus; bracteis demum ultra medium in thecam sessilem subglobosam subcartilagineam undique spinosam coalitis. Plains between the Burro mountains; September, *Bigelow,* (in fruit.) On the Rio Grande, below Presidio del Norte; *Parry.* Near the Piloncilla, Sonora, September; *Thurber.* (No. 1739; *Wright.* His No. 1737 seems to be a slender form of the same.) Plant 1–2 feet high, much branching from the ground. Leaves somewhat persistent, about an inch long, often somewhat hastate at the base, usually somewhat repand-dentate or denticulate. Fertile flowers glomerate in the upper axils, forming a kind of leafy panicle. Male spikes paniculate, nearly naked. Fructiferous bracts indurated, covered with long flat or compressed rigid processes which resemble spines. Near Fort Yuma, California, Major Thomas collected an Obione which appears to be a variety of this species. It sometimes attains the height of 6–10 feet. The leaves are deltoid-ovate, very obtuse and somewhat undulate. Only the male plant was found. It is the same as O. Barclayana of Durand and Hilgard's Report of Williamson's Expedition, but apparently not of Bentham.

OBIONE CANESCENS, *Moq. in DC. Prodr.* 13, *pars* 2, *p.* 212. Abundant at the foot of San Diego Bay, California; *Parry.* Valley of the Rio Grande, from El Paso to Eagle Pass; also on the Gila. (No. 1740 and 1741, *Wright.*) A variety with smaller, ovate or obovate leaves was found on the Burro mountains by *Dr Bigelow;* and on the Gila by *Mr. Thurber.* It is the same

as Wright's No. 1738, and Berlandier's No. 1346; the latter from San Luis Potosi. Gregg found it also at Cerros Bravos, Mexico.

OBIONE OCCIDENTALIS, *Moq. l. c.* Near the Copper Mines and at Santa Barbara; also on the San Pedro; *Bigelow.* On the Pecos and in Chihuahua; *Thurber.* El Paso; *Wright.* Remarkable for its large broadly 4-winged fruit. These wings are either entire or more or less deeply toothed; rarely cut into narrow lobes. The bracts adhere nearly to the summit, while in O. canescens they are united only toward the base.

OBIONE OCCIDENTALIS, var. ANGUSTIFOLIA: foliis angusto-linearibus vel lanceolato-linearibus. Valley of the Rio Grande, from El Paso to 40 miles below San Elcearío; *Bigelow, Wright.* On the Gila; *Thurber.* (No. 1742, *Wright.*) Gregg found it in various places in New Mexico, where it is called *Chanuzo.* It seems to be closely related to O. linifolia, *Moq.*

EUROTIA LANATA, *Moq. Chenop. p.* 81; *Torr. & Gray in Bot. Pope's Rep. p.* 124. Diotis lanata; *Pursh, Fl.* 2, *p.* 602. Hills near the Copper Mines, New Mexico.

CORISPERMUM HYSSOPIFOLIUM, *Linn.; Moq. l. c. p.* 141. Sandhills, Chihuahua; *Thurber.* Alluvions of the Rio Grande; *Schott, Parry.*

ARTHROCNEMUM MACROSTACHYUM, *A. Bunge in Linnæa,* 28, *p.* 573. Arthrocnemum fruticosum, γ macrostachyum; *Moq. Chenop. p.* 111, *& in DC. l. c. p.* 151. Salt marshes between Comanches and Leon Springs, November; *Schott:* Rio Pecos; *Thurber.* Santa Rosa, Cohahuila; *Bigelow.* Plant 1–2 feet or more in height. (No. 1745, *Wright.*) According to Bunge (*l. c.*) Moquin and Fenzl have not distinguished, by reliable characters, Arthrocnemum from Salicornia. To the former genus he refers those species in which the seed is albuminous, and the embryo curved; in the latter those which have exalbuminous seeds and a conduplicate embryo.

SALICORNIA MUCRONATA, *Lagasca Pl. Barill. ex Moq. Chenop. p.* 115. On the beach at Brazos Santiago, May; *Schott.* This plant is shrubby and apparently as tall as the preceding species; the specimen being only a branch, and more than a foot long. I am now inclined to regard it as distinct from S. mucronata of Bigelow, which is a humble annual with thicker spikes, and the flowers more deeply immersed in depressions of the rachis. The latter may be called S. Bigelovii.

SUÆDA MARITIMA, *Dumort.; Torr. Fl. New York,* 2, *p.* 141. Saline soils, Leon Springs, September; *Bigelow.* Plant apparently 3–4 feet high.

SUÆDA FRUTICOSA (*Forsk.*) var.? MULTIFLORA, *Torr. Bot. Whippl. Exp. p.* 130. Sandy hills and ravines near Presidio del Norte, August; *Bigelow.* Rio Pecos; *Thurber.*

PHYTOLACCACEÆ.

RIVINA LÆVIS, *Linn.; Moq. l. c. p.* 11. R. portulacoides, *Nutt. Trans. Amer. Phil. Soc., n. ser.* 5, *p.* 167. Common in alluvions throughout the valley of the Rio Grande and its branches below El Paso; west to Cocospora, Sonora. (Nos. 1729 and 1730, *Wright.*) The branches and leaves are sometimes more or less pubescent.

PHYTOLACCA DECANDRA, *Linn.; Moq. l. c. p.* 32. Mouth of the Rojo San Felipe, September; *Schott.* The specimens seem to belong to a depauperate form of the plant. The racemes are only 6–10-flowered.

LAURACEÆ.

OREODAPHNE CALIFORNICA, *Nees, Syst. Laur. p.* 463; *Torr. Bot. Whipple's Rep., p.* 133. In various parts of California, especially in mountainous districts; *Parry, Thurber.* Besides the

popular names of the plant mentioned in the report here quoted, it is called Sassafras-Laurel, Cajeput Tree, and California Olive. The fruit varies from ovate or obovate to nearly globose.

SANTALACEÆ.

COMANDRA UMBELLATA, *Nutt. Gen.* 1, *p.* 157. Var. ANGUSTIFOLIA. C. pallida, β angustifolia, *Alph. DC. Prodr.* 14, *p.* 637. Hueco mountains and at the Copper Mines, New Mexico; also in western Texas, Chihuahua, and Sonora, April. (Nos. 783 and 784, *Wright.*) We have specimens that connect this variety with the ordinary form of the plant.

LORANTHACEÆ.

PHORADENDRON PAUCIFLORUM, *Torr. in Whipple's Rep. p.* 134. Sierra del Pajarito, Sonora; growing on Juniperus; *Schott.* Yanos; *Capt. E. K. Smith.*

PHORADENDRON CALIFORNICUM, *Nutt. in Jour. Acad. Phil.* (n. *ser.*) 1, *p.* 185; *Torr. l. c.* On cotton-wood (Populus monilifera) along the lower Colorado of California, March and February; *Schott.* On mesquit trees (Algarobia glandulosa), borders of the Gila and near Eagle Pass, western Texas; *Parry, Schott.* Fructiferous spikes variable in length.

PHORADENDRON FLAVESCENS, *Nutt. l. c.* var. GLABRIUSCULUM, *Engelm. in Gray, Pl. Lindh.* 2, *p.* 212. Common in the valley of the Rio Grande, on Algarobia (with male flowers only); *Schott.* On the Mimbres, in fruit; *Bigelow.* The male spikes vary considerably in length and in the number of their joints. Sometimes they exceed the leaves. The axis between the joints is thickly covered with flowers, sometimes to the number of 60 or more.

Var. PUBESCENS, *Engelm. l. c.* Howard's Springs; *Bigelow.*

PHORADENDRON JUNIPERINUM, *Engelm. in Gray, Pl. Fendl. p.* 59. Near the Copper Mines, New Mexico; *Bigelow.* Howard's Springs; *Parry.*

ARCEUTHOBIUM CAMPYLOPODUM, *Engelm. l. c.* On pine trees near Monterey, California; *Parry.* The fertile plant only was collected.

EUPHORBIACEÆ.

The genus Euphorbia has been kindly elaborated for this report by my friend George Engelmann, M. D.

§ I. ANISOPHYLLUM.

EUPHORBIA PETALOIDEA: patulo-ramosissima; foliis oblongis oblongo-linearibus linearibusve retusis mucronatis; glandulis albo-appendiculatis; seminibus lævibus.

α. NICOLLETII: foliis stylisque brevioribus; anthodiis cymulosis; seminibus ovatis.

β. INTERMEDIA: foliis angustioribus; stylis longioribus; anthodiis cymulosis.

γ. NUTTALLII: foliis linearibus; anthodiis alaribus; appendiculis orbiculatis; stylis elongatis, seminibus subglobosis. E. arenaria, *Nutt. Pl. Arkans. p.* 171, *non H. B. K.*

δ. FLAGELLIFORMIS: priori similis, sed appendiculi minimi, styli breves. Of these varieties α and β have not been found within the districts explored by the Boundary Commission, but they probably occur there. The var. γ is common in Texas. Wright's 1826, belongs to var. δ, a New Mexican form.

EUPHORBIA SERPENS, *H. B. K.* E. herniarioides, *Nutt. l. c. p.* 171. In the southwestern parts

of North America (abundant on the Mexican boundary line) and throughout Central and South America, but not in the eastern States. E. microphylla, *Roth*, from India, is the same plant.

EUPHORBIA REVOLUTA (nov. spec.): erecto-patula; foliis linearibus revolutis obtusis basi subæqualibus, stipulis setaceis; anthodiis alaribus; glandulis anguste appendiculatis; stylis recurvis apice bifidis; capsula acute angulata, seminibus angustis acute angulatis transverse rugosis. (Gravelly hills near Rock creek; *Bigelow*. On the Rio Grande; *Wright*, No. 1830.) New Mexico; *Fendler*, No. 789. Very slender, 4–5 inches high; leaves 6–10 lines long and ½ line wide. Habit like a small slender E. petaloidea, but styles and seeds very different.

EUPHORBIA POLYCARPA, *Benth. Bot. Sulph. p.* 50. Dry soils near San Diego, California; *Parry, Schott*. Banks of the Gila; *Major Emory*. Sonora; *Wright*, No. 1854. This is a very variable plant, if all the forms which I refer to here really belong to it. Seeds smooth or undulate, appendages none, or small or large; plant smooth or pubescent, (and then always with short patulous hairs.) Collected by all the botanists from the upper Gila to San Diego. The only species of the section Anisophyllum which, so far as I know, has both smooth and pubescent forms, with the exception of E. hypericifolia.

EUPHORBIA ARIZONICA, (nov. spec.): erecto-patula; foliis e basi lata subæquali ovatis obtusis pilosis; stipulis inconspicuis; anthodiis alaribus longius pedunculatis; appendicibus glandula purpurea multo majoribus obovatis tubo turbinato postice fisso brevioribus; stylis erectis ad medium bifidis ovario puberulo longioribus, stigmatibus filiformibus; capsula pilosa; seminibus rugoso-verrucosis ad angulos acutos crenulatis. Sierra Yanos, Sonora, July; *Schott*. Stems 4–5 inches high; leaves 3–4 lines long, 2½–3 lines wide. Seed very small, involucrum with the appendage 1½ line in diameter.

EUPHORBIA PEDICULIFERA (nov. spec.): procumbens, cinereo-pubescens; foliis ovatis obtusiusculis; stipulis e basi lata lanceolatis; glomerulis parvifloris in ramulis alternis terminalibus; involucris hemisphæricis; glandulis magnis; appendicibus transversis crenatis; stylis patulis pubescentibus ad basin fere bifidis; stigmatibus divaricatis; capsula acute angulata pubescente, seminibus compressis angulatis sulcis 4 profundis transverse incisis. Sonora; *Wright*, (No. 1848,) *Schott*. Spreading 6–12 inches. Leaves 3–4 lines long, oblique. Involucrum large. Seeds 0.7 line long, deeply 5-lobed, similar to some insects.

EUPHORBIA FENDLERI, *Torr. & Gray, Bot. Pope's Rep. p.* 19. E. rupicola, *Scheele in Linnæa*, 22, *p.* 153, *non Boiss.* Common in New Mexico and Western Texas; *Lindheimer, Wright, Bigelow*. Sonora; *Thurber*. Variable in the form of the leaves and the shape or presence of the appendages.

EUPHORBIA ALBOMARGINATA, *Torr. & Gray, l. c. p.* 18. Common in the whole region between western Texas and the Great Colorado, and southward into Mexico. It is No. 330 of Drummond's second Texan Collection.

EUPHORBIA CINERASCENS (nov. spec.): erecto-patula s. subdecumbens, pubescenti-canescens; foliis e basi lata obliqua ovatis s. suborbiculatis obtusis supra glabratis; stipulis lanceolatis minutis mox deciduis; glomerulis lateralibus; involucris canis; glandulis (plerumque purpureis) angustissimis marginatis; stylis brevibus pilosis; capsula acute angulata cana; seminibus ovatis acute angulatis lævisculis. On the Rio Grande; *Wright*. Chihuahua and Sonora; *Thurber*. Bishop's Hill, near Monterey, Mexico; *Gregg*.

β. APPENDICULATA: foliis utrumque cinereis; appendicibus majoribus truncatis crenulatis; stigmatibus longioribus. San Felipe, California; *Dr. Le Conte, Thurber*; and San Gabriel, *Bigelow*. Stem 4–6 inches high; rounded leaves often tawny red, 1½–2 lines long; flowers

few. Mr. Thurber informs us that this plant is called *Yerba de la Golondrina* in Sonora. The Mexicans believe it to be a certain cure for the bite of a rattlesnake and other poisonous animals The bruised fresh plant or the dried, steeped in wine, is applied to the wound. A tincture of the plant is sometimes kept in the apothecarys' shops of that country. According to Dr. Gregg, the name Golondrina is applied to all the prostrate Euphorbiæ.

EUPHORBIA INÆQUILATERA, *Sonder in Linnæa*, 23, *p.* 105. I cannot distinguish from this plant of the Cape of Good Hope a species of the plains of Nebraska, Kansas, and Texas, and which extends into New Mexico, California, and Oregon. There it has been collected since the explorations of *Nicollet* and *Frémont* by almost every traveller, (e. g., *Fendler*, 791, 795, 803; *Wright*, 666, 1823, (in part,) 1846.) The same plant has been sent from Florida by *Blodgett* and *Chapman*, is found on the West India Islands, is undoubtedly the E. Nilagirica, *Miq.*, of India, and has also been observed in New Holland; but it seems unknown in other States east of the Mississippi.

EUPHORBIA GLYPTOSPERMA (nov. spec.): erecto patula seu demum decumbens; foliis e basi valde obliqua (latere inferiore producta) æquilatis oblongis s. oblongo-linearibus obtusis versus apicem subserratis s. integriusculus; stipulis setaceis laciniatis, anthodiis alaribus demum in glomerulos laxos laterales confertis; appendiculis brevibus integris seu crenatis; stylis brevibus apice bilobis, stigmatibus subglobosis; seminibus ovatis argute rugosis ad angulos acutos crenatis. E. polygonifolia, *Hook. Fl. Bor. Am.* fide spec. auctoris *non Linn.*

β. TENERRIMA: foliis parvulis angustis apice vix crenulatis; involucri minuti glandulis vix seu non appendiculatis. On the Rio Grande; also on the Arkansas, and extending to the upper Missouri. (No. 1853, 1855, and 1856, *Wright.*) From a few inches to a foot high. The larger northern forms have leaves 3 to 6 lines long and 1 to 2 lines wide. In β the leaves are 1 to 3 lines long and ½ to 1 line wide; involucrum in the latter only 0.3 line long. Seed very sharply cross-ribbed, similar to that of *E. prostrata*, and notched at the angles.

EUPHORBIA STICTOSPORA (nov. spec.): erecto-patula, foliis e basi obliqua subcordata orbiculatis seu ovatis argute serratis supra subnudis; stipulis subulatis ciliatis; glomerulis lateralibus sessilibus; glandulis angustis appendiculatis; stylis ovario pubero brevioribus patulis indivisis; stigmatibus 3 capitatis; capsula puberula; seminibus angustis acute angulatis exsculpto-punctatis. From Kansas (*Fendler*, 798,) to Santa Fé (*Fendler*, 797) and Doña Ana, (*Wright.* 59,) New Mexico, and Corallitas, Chihuahua; *Thurber*. Stem 3–6 inches high. Leaves 2–4 lines long; apparently near *E. prostrata*, but styles and seeds very different.

EUPHORBIA PROSTRATA, *Ait.* This variable and often mistaken species is found from western Louisiana (*Dr. Hale*) to Texas; (*Lindheimer*, 533;) (*Berlandier*, 1100, 2530;) (*Wright*, 1848 in part, 1855 in part.) It seems to be a common plant in the West India islands, Mexico, and South America. It occurs in Africa and India. *Euphorbia tenella*, H. B. K., and *E. callibrichoides*, H. B. K., are forms of the same species, which can always be recognized by the ciliate angles of the capsule and the sharply rugose seeds, notched at the angles.

EUPHORBIA DIOICA, *H. B. K.* (E. anceps, *Benth.* E. callibrichoides; *Schauer*, etc.,) a common and very variable plant of Mexico, Central America, and the West India islands, has been collected by *Dr. Antisell* on the upper Rio Grande.

Var.? INDIVISA, distinguished by the annual root, the less coriaceous, less oblique and less distichous leaves, the more scattered involucra and the undivided styles; has been found near the Copper Mines, New Mexico, by Mr. Wright, (No. 1845) and in Sonora by Mr. Thurber, (No. 963.)

EUPHORBIA SERRULA (nov. spec.): patula seu decumbens; caule patenter piloso; foliis e basi valde obliquo obtusiuscula seu subcordata oblongis sæpe falcatis obtusis argute grosseque serratis, subtus pilosis; stipulis lanceolatis laciniatis; glomerulis lateralibus appendicibus angustis integris seu crenulatis; stylis ovario glabro brevioribus patulis ad basis fere bifidis; seminibus ovatis lævibus costato-angulatis. Western Texas and New Mexico. (No. 658, 1843 and 1844, *Wright*. No. 796 and 804, *Fendler*.) Stems 4–6 inches long. Leaves 3–5 lines long, 1–3 lines broad, sharply and coarsely serrate; seeds larger than in all the foregoing species, 0.8 line long, remarkably angled.

EUPHORBIA VILLIFERA, *Scheele in Linnæa* 22, *p.* 153. Western Texas; *Berlandier*, 2084; *Lindheimer*, 530; *Wright*, *Thurber*. In various parts of Mexico; *Gregg*. Root annual, stems erect, often a foot high.

EUPHORBIA HYPERICIFOLIA, *Linn. Sp.* 1, *p.* 454. New Mexico; *Wright*. (No. 1842 in part) Chihuahua; *Thurber*. The true Linnæan plant probably comes from the West Indies and other tropical countries, and has also been sent from Florida by Dr. Chapman. It is distinguished by smaller anthodia, generally disposed in denser clusters, smaller capsules and smaller paler seeds. The common North American form, which has also been collected abundantly along the boundary, has larger and more scattered anthodia, larger capsules and larger blackish seeds, and may be distinguished as var. *communis*, as it seems to be the more common form throughout the warmer countries around the whole globe.

EUPHORBIA PILULIFERA, *Linn.* β DISCOLOR: diffusa; foliis e basi valde obliqua ovatis subrhomboideis acutiusculus serratis, purpureo-maculatis, stipulis subulatis, capsula parvula pilosa, seminibus minutis ovatis acutis undulato-tuberculatis. Sonora; *Thurber*. *Wright*, No. 1842, in part. Mr. *Blodgett* found it in Florida. Stems ½–1 foot long. Leaves 1–1½ inch long; differs in shape and color of leaves from the usual forms of E. pilulifera; hair of the stem as in all forms of this species yellow and jointed; involucre only ½ line long; heads 3–4 lines in diameter; seed scarcely more than ½ line long.

EUPHORBIA CAPITELLATA (nov. spec.): annua, erectiuscula seu demum diffusa; caulibus elongatis puberulis; foliis e basi valde obliqua oblongo-linearibus subnudis argute serrulatis mucronatis; stipulis lanceolatis laceris; glomerulis densifloris terminalibus fere aphyllis; involucri glandulis longius stipitatis, appendiculis orbiculatis s. late obovatis integris; stylis ovario hirto longioribus ad medium bifidis; stigmatibus filiformibus divaricatis; capsula puberula; seminibus ovatis acutatis angulatis rugoso-tuberculatis. Valleys at San Bernardino, Sonora; *Wright*, (No. 1,849.) Stems 6–10 inches long; leaves 6–8 lines long, 2 lines wide; heads white, showy, 4–6 lines in diameter.

EUPHORBIA PYCNANTHEMA (nov. spec.): perennis, erecto patula, canescente-pubescens; foliis e basi lata obliqua cordata ovatis s. oblongis obtusiusculis sæpe mucronulatis integris s. subserrulatis, scabris; stipulis lanceolatis fissis; glomerulis terminalibus multifloris quasi involucratis; involucris pilosulis (primariis) late orbiculato-appendiculatis seu (secundariis) subnudis; stylis fere ad basis fissis patulis; stigmatibus divaricatis clavellatis; capsula subglobosa pubescente; seminibus acute angulatis transverse rugulosis punctatisque. Mountain sides near Lake Santa Maria, Chihuahua; *Wright*. Numerous stems 6 inches high, from a thick ligneous root; leaves 4–5 lines long. General appearance of a small labiate plant with terminal involucrate heads, similar in many respects to the last, but more erect, more hairy, leaves shorter. Remarkable for the different involucres on the same head, reminding one of Hydrangea or some Umbellifera.

EUPHORBIA LATA. E. DILATATA, *Torr. & Gray, Bot. Pope's Rep. p.* 19; non *Hochst. in Richard.*

Flor. Abyssin. Western Texas, San Pedro; *Wright*, No. 1841. On the Cimaron; *Fendler*, No. 794. Eagle Springs; *Bigelow.*

EUPHORBIA ACUTA (nov. spec.): perennis, multicaulis, erecta, foliosa, hirsuta; foliis e basi obtusa subæquali lanceolatis acutatis cartilagineo-mucronatis supra nudis; stipulis filiformibus mox deciduis; anthodiis versus caulis apicem alaribus s. pseudoaxillaribus sparsis; involucris hemisphæricis appendicibus truncatis crenatis lobatisve; stylis patulis ultra medium bilobis, ovario cano longioribus capsula cana; seminibus subcubicis acutis acute angulatis lævibus. Stony prairies western Texas, along the San Pedro and Pecos rivers, &c.; *Bigelow, Schott.* (No. 1739 and 1749, *Wright.*) Stems ½–1 foot high; stiff rigid, leaves 6–10 lines long, 3–6 lines wide, well characterized by the very acute point; seeds 1 line long.

EUPHORBIA ANGUSTA (nov. spec.): perennis, erecta, elatior, rigida; foliis lanceolato-linearibus basi acuta subæqualibus acutis integris demum glabratis; stipulis subulatis minutis deciduis; anthodiis pseudoaxillaribus sparsis; appendicibus truncatis crenatis sæpe bilobis erectis; stylis brevibus erectis apice bilobis; capsula cana acutangula; seminibus ovato-cubicis acutangulis transverse rugosis foveolatis. In rocky places western Texas; *Lindheimer*, No. 694; *Wright*, No. 1828. On the Rio Grande; *Schott.* Erect, 6–15 inches high; several stems form a large black perennial root with few or numerous elongated branches; leaves few, 6–15 lines long, 1–2 lines wide. Seeds 0.8 line long, strongly marked.

EUPHORBIA FLORIDA (nov. spec.): annua, erecta, patulo-ramosa, glaberrima; foliis lanceolato-linearibus seu linearibus in petiolis attenuatis serrulatis mucronatis; stipulis lineari-subulatis sæpe 2–3-fidis; involucris alaribus in cymulas terminales laxas congestis; pedunculis petiolum longe superantibus; lobis involucri ovatis acutis seu acuminatis ciliatis seu rarius laceris; appendicibus magnis (involucro ipso majoribus) orbiculatis seu ovatis petaloideis integris; stylis ovarium æquantibus seu superantibus basi coalitis ad medium seu ultra bifidis; stigmatibus filiformibus; capsula obtuse angulata; seminibus subcubicis acute angulatis lævibus transverse 2-costatis. Sonora; *Wright*, (No. 1829,) *Thurber, Schott.* Stem ½–1 foot high; leaves 12–18 lines long, 1–1½ line broad; margin revolute, and serratures thereby often invisible. Involucre with large bright white appendages, 3 lines in diameter.

EUPHORBIA TRACHYSPERMA (nov. spec.): annua, erecta, glaberrima; foliis e basi subæquali obtusa seu angustata oblongo-lanceolatis serratis mucronatis; stipulis filiformibus seu subulatis setaceo-fissis; anthodiis alaribus demum in cymulas paucifloras terminales s. laterales confertis; appendicibus angustis albis; stylis ultra medium bifidis; capsula obtusangula; seminibus subcubicis faciebus lævisculis, angulis acutis crenatis asperatis. San Pedro; Sonora, *Wright*, No. 1832. Slender, erect, about 1 foot high, branches erect, few; leaves 9–12 lines long, 2–3 lines broad; seed 1 line long.

EUPHORBIA EXSTIPULATA (nov. spec.): annua, erecto-patula, ramosa, glabriuscula seu minute sparsimque aspera; foliis lanceolatis seu lanceolato-linearibus argute serratis basi æquali in petiolem brevem angustatis; stipulis subnullis s. glanduliformibus; anthodiis alaribus solitariis; pedunculis petiolo brevioribus; appendicibus anticis plerumque 2-lobatis, posticis majoribus 4-lobatis; stylis ovarium ad angulos scabrum æquantibus, profunde bipartitis; stigmatibus filiformibus; seminibus magnis subcubicis verrucosis et transverse 2–3-costatis. Western Texas; *Wright*, (1833 and 1838.) New Mexico; *Fendler*, (No. 790.) Sonora; *Thurber, Bigelow, Parry.* Stem about 6 inches high; leaves about 1 inch long, 1–2 rarely 3 lines wide, sometimes not absolutely opposite, but a little separate; seed 1 line long, with thick cross-ribs. A transition form to the next sections.

§ II. ZYGOPHYLLEÆ.

EUPHORBIA HEXAGONA, *Nutt. in Spreng. Syst.* 3, *p.* 791. E. heterantha, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 173. Rio Coleto, Texas; *Thurber*. "Many years ago Mr. Nuttall gave me specimens of this plant, named E. hexagona. Part of these were sent to Sprengel, who first published a description of the species in the work quoted. Eight years afterwards Mr. N. described the plant under another name. It is remarkable for being polygamous; most of the involucres containing only male flowers."—*Torrey, MSS.*

EUPHORBIA BILOBATA (nov. spec): annua, erecta, gracilis; foliis oppositis breviter petiolatis lanceolato-linearibus acutatis integris glabriusculis, rameis angustioribus; anthodiis alaribus campanulatis; glandulis bilobis, appendiculis binis lanceolatis seu abbreviatis; stylis vix basi connatis ad medium bilobis; stigmatibus erectis subteretibus; capsula læviuscula, seminibus ovatis acutis angulato-tuberculatis. Near the Copper Mines, New Mexico; *Bigelow*. Eastern Sonora; *Wright*, (No. 1831.) Stems 6–15 inches high; leaves 10–15 lines long, 1-- lines broad; seeds 0.8 line long, strongly tuberculate and almost angular. Glands remarkable and very constant in shape; appendages white. Near E. hexagona; distinguished by the acuter more uniform leaves, bilobed glands, terete stigmata and smaller tuberculate seeds.

EUPHORBIA BIFURCATA (nov. spec.): glabra; caule erecto dichotomo; foliis oppositis ovatis seu obovatis in petiolem gracilem subæquilongum angustatis argute serratis obtusis basi glanduloso stipulatis; anthodiis alaribus breviter pedunculatis; lobis 5 ovatis truncatis fimbriato-multifidis; glandula singula cyathiformi late albo-appendiculata, appendice transverso emarginato; stylis basi coalitis ad medium bifidis, stigmatibus filiformibus. Moist places, Valley of the Limpio, July; *Bigelow*. Over a foot high; leaves 1 inch long, ¼ inch wide; petiole a little shorter than leaf.

§ III. CYATHOPHORÆ.

EUPHORBIA DENTATA, *Michx.*; β RIGIDIA: humilior rigida; foliis parvis coriaceis reticulato-venosis scabris margine revolutis. Head of San Pedro river; *Wright*. (No. 1837.) Near Monterey, Mexico; *Dr. Edwards*. γ. CUPHOSPERMA: erecta, stricta, dentata seu parce pilosa; foliis lanceolatis seu lineari-lanceolatis elongatis subdentatis; capsulis glabris seu pilosis; seminibus majoribus tuberculato-angulatis. Copper Mines, New Mexico; *Wright*, (No. 1834,) to Sonora; *Schott*. Ojo de Gabilari, Chihuahua; *Thurber*.

EUPHORBIA HETEROPHYLLA, *Linn.* (E. cyathophora, *Murr.*) Var. GRAMINIFOLIA: foliis angusto-linearibus. Crevices of rocks and dry beds of rivers. Rio San Pedro, Texas; *Bigelow, Schott, Wright*, (No. 653.) South of El Paso; *Wright*, (No. 1835.)

EUPHORBIA BARBELLATA, (nov. spec.): annua, erecta, glabriuscula; foliis sparsis linearibus seu lanceolato-linearibus seu ovatis lobatisque breviter petiolatis parce argute dentatis, subtus ad nervum medium parce pilosis, basi pilis longioribus confertis barbatis; foliis floralibus ovatis seu e basi dilatata elongatis, basi roseis; anthodiis glomeratis majusculis; glandula singula sessili lobis inciso-dentatis breviore; stylis brevibus erectis basi vix connatis ad medium bifidis. On the Rio Grande, near Eagle Pass; *Wright*. Rio Frio; *Bigelow*. Near E. heterophylla, but stouter, leaves very sharply serrate, involucre larger, styles shorter. Leaves 2–4 inches long, ½ or ¾ inch–1 or 2 lines wide. Beard of coarse hair at base of leaves very conspicuous.

EUPHORBIA COLORATA (nov. spec.): erecta, glaberrima; foliis breviter petiolatis sparsis patu-

lis elongato-linearibus revolutis integris ; foliis floralibus basi paullo dilatatis puniceis subinde circinatis ; glandulis 1–2 stipitatis cyathiformibus compressis margine revoluto sæpe crenulatis involucri lobos laciniatos coloratos superantibus ; stylis brevibus purpureis erectis longe connatis, apice bifidis, stigmatibus acutis demum recurvis. Dry arroyas, Aqua Zarco, Sonora, May ; and Santa Cruz, Sept. ; *Thurber, & Capt. E. K. Smith.* Specimens incomplete, nearly a foot high. Leaves 3–4 inches long, scarcely more than a line wide ; floral leaves shorter and about 2 lines wide, deep crimson. Distinguished from E. heterophylla by the narrow revolute leaves, etc. Margin of involucre and styles also purplish. Capsule glabrous and seeds tuberculate, as in the allied species.

EUPHORBIA RADIANS, *Benth. Pl. Hartweg, p.* 38. Plains between San Bernardino and Santa Cruz, Sonora, April ; *Capt. E. K. Smith.* Dry valleys near Buena Vista, Mexico ; *Dr. Gregg, Dr. Wislizenus* ; Mexico ; *Berlandier,* (No. 116 and 1375.) Root tuberous ; flowers in early spring, before the leafy shoots put out.

EUPHORBIA ERIANTHA, *Benth. Bot. Sulph. p.* 51. Sonora ; *Wright,* (No. 1841?)

§ IV. UMBELLATÆ.

EUPHORBIA WRIGHTII, *Torr. & Gray, Bot. Pope's Rep.* On the San Felipe and the San Pedro, western Texas ; *Wright,* (No. 1827.)

EUPHORBIA MULTICAULIS, (nov. spec.) : annua seu biennis, multicaulis, humilis, erecta, glabra ; foliis lineari-oblanceolatis acutis mucronatis serrulatis basi angustata sessilibus ; umbellis trifidis, ramis bifidis, bracteis lanceolatis, superioribus ovato-lanceolatis acutis ; involucri glandulis tranverse ovatis ; stylis basi liberis ad medium seu ultra bifidis ; capsulæ coccis dorso-verrucosis ; seminibus lenticularibus lævibus fuscis. Sonora ; *Thurber.* About a dozen stems form a tapering root, 6 inches high, and with erect branches ; leaves 4–6 lines long, 1 line wide. Nearly allied to E. obtusata.

EUPHORBIA DICTYOSPERMA, *Fisch. & Mey. Ind. Sem. Petrop.* 1835. E. Arkansana, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 26. Western Texas ; *Wright.* Var. MEXICANA : annua seu plerumque biennis, e basi erecto-ramoso ; foliis versus apicem crenato-serratis, lobis involucri subintegris ; ovarii coccis dorso solum verrucosis. Valley of the Nagas, Balson de Mapimi, *Dr. Gregg ;* western Texas ; *Wright,* (No. 1824.) γ LEIOCOCCA : capsulis lævibus seu vix hinc inde verruculosis. Texas ; *Drummond ;* II. 327. Near the Colorado, of Texas ; *Wright.*

EUPHORBIA TETRAPORA (nov. spec.): annua, erecta, glaberrima ; foliis cuneatis obtusis seu plerumque retusis emarginatis obcordatisve ; umbellis trifidis ; bracteis spathulatis seu superioribus orbiculatis basi truncatis ; cornubus involucri setaceis glandulam transversam æquantibus ; capsula dorso lævi ; seminibus facie ventrali 4-punctatis, dorsali læviusculis. Georgia ; *Boykin.* Louisiana ; *Hale.* Texas ; *Lindheimer, Wright.* Near E. Peplus as is the following species, but distinguished by the capsule and the seeds.

EUPHORBIA PEPLIDION (nov. spec.): annua, erecta, glaberrima, e basi ramosissima ; foliis confertis e basi angustata lineari-oblanceolatis obtusis ; umbellis 3-fidis dichotomis, bracteis lanceolatis acutis ; cornubus involucri glandulam ipsam æquantibus linearibus obtusis ; capsulæ coccis obtusis non alatis seminibus facie ventrali 2-sulcatis, dorsali punctato-exsculptis. Sandy soils, western Texas ; *Wright,* (No. 1823.) A small plant, 3–4 inches high, much branched from the base, of the habit of E. exigua. Seeds very similar to those of E: Peplus, 0.6 line long.

EUPHORBIA PEPLOIDES, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 172, non *Gouan.* E. longicruris, *Scheele in Linnæa,* 22, *p.* 152. Western Texas ; *Wright,* (No. 1822 ;) *Lindheimer,*

(No. 529 and 698;) *Drummond*, (Coll. II, No. 331.) If E. peploides, *Gouan*, of Southern Europe should prove to be a distinct species, Scheele's name must stand for ours.

EUPHORBIA BRACHYCERA (nov. spec.): annua (?), multicaulis, ramosa, erecta, glaberrima; foliis in petiolum brevissimum angustatis lanceolatis seu lineari-lanceolatis acutis mucronatis; umbella 3-fida seu raro 4–5-fida; ramis pluries bifidis; bracteis inferioribus ovato-lanceolatis superioribus rhombeo-orbiculatis mucronatis; glandulis brevissime obtuseque cornutis; seminibus majusculis ovatis maculis irregularibus sæpe confluentibus leviter impressis. Western New Mexico; *Wright*, (No. 1821.) Many stems a foot high from a stout but apparently annual or biennial root; leaves 6–9 lines long, about 2 lines wide, patulous (not erect as in E. esulæformis) regularly lanceolate; upper part of the stem quite ramose; horns shorter than in any of our species, and sometimes almost rudimentary. Seed 1 line in length, similar to those of E. esulæformis, montana and Roemeriana.

EUPHORBIA MONTANA (nov. spec.): perennis, glaberrima; caulibus pluribus ascendentibus; foliis brevibus lanceolatis ovatis obovatis seu suborbiculatis acutis seu obtusis basi subinde subcordatis subsessilibus coriaceis glaucis; bracteis omnibus orbiculato-triangularibus, rarius subcordatis, superioribus subinde transverse ovato-triangularibus, omnibus cuspidatis; glandulis semilunatis, cornubus triangulatis brevibus; seminibus maculis plus minus impressis obscuris confluentibus undique notatis.

α GRACILIOR: caule tenuiori; foliis minoribus suborbiculatis obovatis seu lanceolatis.

β ROBUSTA: caule robustiore; foliis bracteisque majoribus crassioribus late ovatis seu ovato-cordatis.

The var. *α* in New Mexico; *Fendler*, (No. 786;) *Wright*, (No. 661, 1825.) San Luis Mountains, Sonora; *Capt. E. K. Smith.* Stems 4–8 inches high, leaves 2–3 lines long, in young specimens imbricate and red.

Var. *β*, on the upper Platte; *James, Nuttall, Frémont;* is a much stouter plant. Leaves 5–6 lines long, seeds larger. Dr. Wislizenus collected intermediate specimens near Albuquerque.

EUPHORBIA CRENULATA (nov. spec.): annua, erecta, glaberrima; foliis obovatis acutis in basin attenuatis minute crenulato-serrulatis mucronatis; umbella 5-fida, bracteis inferioribus late ovatis acutis, superioribus transversis, omnibus tenuiter serrulatis mucronatis; involucri glandulis longe tenuiterque cornutis; seminibus ovato-subglobosis cinereo-fuscis, maculis obscurioribus irregulariter confluentibus parum impressis. California; *Hartweg*, (1950.) Near Monterey; *Dr. Parry.* About 1–2 feet high, simple or branching above; leaves about 9 lines long, 5 lines broad, involucells broader and shorter; seed nearly a line long, unusually dark for this section. One of the very few peploid Euphorbiæ with crenate leaves.

EUPHORBIA ESULÆFORMIS, *S. Schauer in Linnæa*, 20, *p.* 729. Near the Copper Mines, New Mexico, *Wright*, (No. 1820;) *Bigelow.* On the Nueces, western Texas; *Wright.* San Luis Mountains, Sonora; *Capt. E. K. Smith.* This species seems to be scarcely distinguishable from the Mexican E. campestris; *Schlechtendal.* The original specimen of the latter, however, has longer and more slender horns; the seeds are wanting. The original specimen of E. esulæformis has similar but smaller seeds than our plant; the horns are also very short and incurved, the gland itself is truncate and notched. Euphorbia brachycera and E. montana come very near to this species.

Var? SUBDENTATA: foliis oblongo-linearibus brevissime petiolatis, inferioribus integris obtusis, superioribus versus apicem mucronatum dentatis, bracteis ovatis obtusis sæpe grosse dentatis.

San Francisco Spring, Sonora; *Parry*. The seeds were not ripe. This is, perhaps, a distinct species, but it must remain as a variety until more complete specimens are obtained.

EUPHORBIA LATHYRIS, *Linn.* is somewhat naturalized around Monterey, California. It was doubtless introduced by the Spaniards. We have it also from Saltillo, Mexico, where it was collected by Gregg.

§ V. SPARSIFLORÆ.

EUPHORBIA MISERA, *Benth. Bot. Sulph. p.* 51. Near the sea, San Diego, California; *Parry*. A straggling bush, about 3 feet high, abounding in a milky juice. Nuttall found it at Santa Barbara.

EUPHORBIA ANTISYPHILITICA, *Zucc. Acad. Mon.* 1, *p.* 292. Rocky and gravelly hills along the Rio Grande, from the Presidio del Norte to Laredo; *Bigelow, Schott*. Remarkable for its long terete nearly leafless branches, which resemble an Equisetum or an Ephedra.

PHYLLANTHUS CAROLINIANUS, *Walt. Fl. Car. p.* 228; *Ell. Sp.* 2, *p.* 661. P. obovatus, *Willd. Sp.* 4, *p.* 574. Maschalanthus obovatus, *Nutt. Trans. Amer. Phil. Soc.*, (*n. ser.*) *p.* 175. Southern Texas, common.

PHYLLANTHUS POLYGONOIDES, *Nutt. l. c.* P. Roemerianus, *Scheele in Linnæa*, 25, *p.* 583. Dry, sandy, and rocky places along the Rio Grande, from New Mexico to the Gulf, and westward in the Mexican States. (No. 1819, *Wright*; No. 337, Coll. II, *Drummond*.) This is certainly an annual, but late in the season, when the lower part of the stem and the root have become indurated and ligneous, it appears as if suffruticose.

PHYLLANTHUS ERICOIDES (n. sp.): fruticulosus, ramosissimus; foliis oblongo-lanceolatis imbricato-confertis subsessilibus glabris coriaceis mucronatis; floribus dioicis axillaribus solitariis brevi-pedicellatis; calycibus 5-(raro 6-) partitis. High mountains near the Rio Grande, in Chihuahua, October; *Parry*. Plant about a span high. Leaves about 2 lines long and scarcely more than half a line wide, acute, nearly sessile, with a pair of subulate persistent stipules at the base. Male flowers about a line long. Calyx deeply 5-parted; the segments oblong and somewhat obtuse. Petals none. Stamens 3; the filaments united into a column, at the base of which are 5 roundish glands. Female flowers rather larger than the male; the segments oblong, acute. Petals none. Ovary with 5 glands at the base; cells uniovulate. Styles 3, two-cleft; stigmas sub-globose. A well characterized species, remarkable for its very small crowded leaves.

LEPIDANTHUS PHYLLANTHOIDES, *Nutt. l. c.* Ravines on the San Pedro river, western Texas; *Bigelow, Schott*. (No. 636, *Wright*.) Mr. Nuttall's description of this very distinct genus can hardly be improved.

CROTON BERLANDIERI (n. sp.): suffruticosum; ramulis inferne nudis; foliis ovatis cordatis acuminatis membranaceis utrinque stellato-pubescentibus integerrimis vel obsolete denticulatis basi eglandulosis; floribus monoicis, masculis breviter racemosis 5-petalis 20–30-andris, fœmineis petaliferis; stylis bis bifidis; fructibus tomentosis demum glabratis. Neuvo Leon, December; *Thurber*. (Nos. 708 and 2125, *Berlandier*.) Plant apparently about a foot high. Leaves 1–2 inches long, 1–1½ inch wide; the petiole more than half the length of the lamina. Racemes terminating the branches, pedunculate. Male flowers 10–15, crowded on pedicels about a line long. Petals oblong. Stamens with 5 roundish glands at the base. Female flowers 1–2 at the base of the raceme. Calyx woolly, 5-parted; the segments oblong. Petals 5, very narrow, two-thirds the length of the calyx. Ovary woolly, with 5 glands at the base. Styles deeply

twice bifid. We have not been able to find any described species to which we can refer this Croton. It is a genuine species of the genus as characterized by Klotsch.

CROTON SONORÆ (n. sp.): fruticosum; foliis ovatis acutiusculis basi obtusis integris supra glabriusculis infra sparsim stellato-pubescentibus; floribus monoicis, masculis paucis sub-13-andris, petalis 5 calyce æqualibus; fœmineis solitariis vel binis, petalis 5 angustis calyce brevioribus; disco 5-lobo; stylis apice bifidis. Sierra de Nayos, July; *Schott*. A small shrub, much branched; the old branches smooth, younger ones furfuraceous. Leaves about an inch long, green both sides but rather paler underneath. Petals of the male flowers hairy at the base. Stamens with 5 spherical orange glands surrounding the receptacle. Female flowers one or two at the base of the short and few-flowered male raceme. Segments of the calyx rather acute. Petal linear-oblong, two-thirds of the length of the calyx. Disk surrounding the base of the ovary rather fleshy, 5-lobed. Styles rather stout, somewhat dilated and moderately bifid. Young fruit subglobose.

CROTON SUAVEOLENS (n. sp.): fruticosum; foliis ovatis obtusis basi rotundatis integerrimis eglandulosis utrinque densissime lanato-tomentosis; floribus monoicis, fœmineis solitariis vel binis, subsessilibus; stylis profunde bipartitis; staminеis brevi-racemosis 12–14-andris. On the Rio Grande, No. 1804, *Wright*. A shrub with stout terete stellately pubescent branches. Leaves growing mostly towards the extremity of the branches, rather thick, paler underneath. Staminate flowers 6–10 in a short raceme, sessile, subtended by minute pinnatifid bracts. Petals 5, oblong. Stamens commonly 14. Fertile flowers usually in pairs at the base of the staminate flowers. Calyx deeply 5-parted; the segments lanceolate and acute. Disk somewhat 5-lobed, with 5 linear or club-shaped processes (petals?) alternating with the calyx-segments. This species seems to be near C. pellitus, *H. B. K.*

C. SUAVEOLENS, var. OBLONGIFOLIUM: foliis oblongis supra discrete stellato-pubescentibus, subtus dense tomentosis; racemo masculo subelongato multifloro, floribus subsessilibus. Rocky ravines along the Rio Grande, from the Pecos and San Pedro to the Gulf. No. 1802, *Wright*, from the Painted Caves, is probably the same, but the specimens are more herbaceous, and they may be only luxuriant shoots. Leaves 1–2 inches long and ½–¾ inch wide, the upper surface much darker than the lower, rather acute and somewhat mucronate. Flowers monœcious; male raceme an inch or more in length. Fertile flowers 1–2. Styles 2-parted nearly to the base.

CROTON LINDHEIMERIANUM, *Scheele in Linnæa*, 25, *p.* 580. Rocky hills, western Texas; New Mexico, Chihuahua and Nuevo Leon; Buena Vista; *Gregg*. (Nos. 641 and 1805, *Wright*.) Plant upright, 1–2 feet high; the branches herbaceous from a woody base. Leaves whitish tomentose with stellate hairs which are somewhat confluent in the centre. Flower smostly dicœcious, rarely monœcious, in short racemes, which are subterminal and axillary. Staminate flowers with lanceolate ciliate petals. Stamens about 12; a 5-lobed disk at the base of the hairy filaments. Fertile flowers on pedicels 2–3 lines long; calyx deeply 5-parted. Petals sometimes wanting but usually present and very unequal, 1–2 of them linear and nearly as long as the calyx, the others much shorter or wanting. Disk conspicuous, 5-lobed; the lobes opposite the segments of the calyx. Styles parted nearly to the base; the divisions filiform. This species is known by the name of Mexican Tea.

CROTON FRUTICULOSUM (*Engelm. MSS.*): caule basi fruticoso; foliis ovatis vel lanceolato-ovatis acuminatis acutisve subcordatis remote minutissime denticulatis eglandulosis supra viridis puberulis subtus dense stellato-pubescentibus; floribus monoicis pedicellatis, masculis racemosis 10–5 andris 5-petalis, fœmineis apetalis; stylis profunde bipartitis, laciniis elongatis filiformibus.

Mountain sides and rocky ravines, western Texas; Chihuahua and Sonora. (Nos 639 and 1803, *Wright*; the latter a dicœcious form. Nos. 176, 177, and 297 Coll. 1846; Nos. 134 and 297 Coll. 1847, *Lindheimer*. No. 3212, Berlandier, in part; the specimens with hairy fruit being C. trichocarpa, *Torr*. Leaves 1 to 2½ inches long, and half an inch to an inch wide, pubescence of the under surface often of a yellowish tinge. Inflorescence terminal and axillary in the upper leaves. Staminate flowers 10–20 or more. Petals 5-oblong. Stamens exserted; filaments smooth. Disk 5-lobed, glandular. Fertile flowers usually 2, sessile, apetalous; disk indistinct. Capsule globose-trigastric, covered with a short canescent stellate pubescence.

* * HENDECANDRA.

CROTON MURICATUM, *Nutt. in Trans. Amer. Phil. Soc. (n. ser.)* 5, *p.* 173. Hendecandra Texensis, *Klotsch in Erich. Arch.* 1, *p.* 252. H. multiflora, *Torr. in Frém. 1st Rep. p.* 96. New Mexico, Central and Western Texas, Chihuahua and Sonora. (No. 1799, *Wright*; No. 1548, *Berlandier*.) In Nuttall's plant from Arkansas, and in specimens from the Upper Platte, the leaves are densely clothed with stellate hairs on both surfaces, but usually the hairs are rather scattered on the upper side. The fruit is roughened (often only obscurely) with small protuberances. Styles 2 parted and the divisions twice cleft, so that there are 24 stigmas in all.

CROTON MARITIMUM, *Walt. Fl. Carol. p.* 383; *Ell. Sp.* 2, *p.* 646. Hendecandra maritima, *Klotsch, l. c.* excel. syn. Crotonis monanthogynis. Galveston, Texas; *Schott*. (No. 3213 *Berlandier*.) Flowers apetalous. Stamens 11–16; filaments hairy. Disk irregularly lobed: of the fertile flowers annular and obscurely 5-lobed. Styles thrice cleft.

CROTON ARGYRANTHEMUM, *Michx. Fl.* 2, *p.* 215. Western Texas, on the Lower Rio Grande, rare. (No. 1554 and 2552, *Berlandier*.) Apparently suffruticose. Under surface of the leaves somewhat silvery with stellate scales. Flowers monœcious in short terminal racemes. The staminate on short pedicels. Petals 5, oblong. Stamens 9–11. Disk with 5 glandular lobes. Fertile flowers 4–8 in each raceme, apetalous. Styles twice cleft at the summit; more deeply divided in Berlandier's No. 2552 than in the Texan plant.

CROTON (HENDECANDRA) PROCUMBENS, *Eschsch. in Mem. Acad. Petersb.* 10 (*sub Hendecandra*); *Hook. & Arn. Bot. Beech., p.* 389, *t.* 91. C. gracile, *H. B. K. Nov. Gen. & Sp.* 2, *p.* 69. Astrogyne crotonoides, *Benth. Pl. Hartw., p.* 14. Sandy places in various parts of California; *Parry, Rich, Le Conte, Frémont*. Banks of the Colorado; *Schott*. On the Gila River; *Emory*. Along the Rio Grande, from Frontera downward, in Western Texas, Chihuahua and Nuevo Leon; *Wright, Thurber, Bigelow*. (Nos. 1800 and 1801, *Wright*; No. 3211 *Berlandier*, a broader leaved form with more silvery scales.) Some of the forms much resemble C. argyranthemum. That species differs, however, in being only slightly woody at the base; the racemes are short and the flowers are 5-petalled, whereas C. procumbens is decidedly shrubby, the racemes are elongated and the flowers apetalous. In the latter, also, the styles are deeply twice cleft. A remarkably slender variety of the plant, in which the racemes (or rather the axes, from which the lower flowers have fallen) are from 2 to 6 inches long, was found by Dr. Bigelow in a dry arroyo opposite Presidio del Norte.

* * * PILONOPHYTUM, *Klotsch*. Heptalon, *Raf*.

CROTON CAPITATUM, *Michx. Fl.* 2, *p.* 214, *Gray, Man. ed.* 2, *p.* 391. Pilonophytum capitatum, *Klotsch., l. c.* On the Rio San Antonio, Texas; *Schott*. Rio Pecos; *Thurber*, (No. 640, *Wright*, Nos. 861 and 2281, *Berlandier*. No. 862 seems to be the same plant, with the flowers in an abnormal state.)

* * * * GEISELERIA, *Klotsch.*

CROTON GLANDULOSUM, *Linn.; Michx. Fl.* 2, *p.* 214; *Ell. Sk.* 2, *p.* 648. Geiseleria glandulosa, *Klotsch.* On the Rio Grande, near Eagle Pass; *Schott, Bigelow,* (No. 638 *Wright.*) In the staminate flowers the calyx is 4–5-parted, the petals 4–6, and the stamens vary from 4 to 8. The calyx of the fertile flowers is unequally 4–5-parted. A common species in the southern and southwestern States, extending into Mexico and South America.

In the herbarium of Berlandier are the following species of Croton which do not occur in any of the Mexican Boundary collections.

CROTON TRICHOCARPUM (n. sp.): fruticosum; foliis lanceolato-ovatis acuminatis vel acutis denticulatis supra glabriusculis subtus canescente stellato-pubescentibus; floribus dioicis, masculis longe spicatis sub-16-andris, petalis calyce æqualibus; fœmineis brevispicatis, petalis 5 angustis calyce brevioribus; stylis profunde bipartitis; fructibus hirsutissimis. Matamoras and San Fernando, Cohahuila; *Berlandier,* Nos. 1503, 1540, 2244, 3003, 3040, and 3212 (in part.) A shrub apparently about 2 feet high. Leaves 1½ to 2½ inches long and half an inch to more than an inch wide; (in Nos. 1503 and 3003 smaller and not acuminate,) obtuse, or somewhat acute at the base. Male spikes 2 to 3 inches long, the flowers on very short pedicels. Petals spatulate-lanceolate, ciliate with long hairs on the margin. Fertile spikes much shorter than the male; the flowers sessile. Sepals acute. Petals lanceolate linear. Disk a narrow ring. Capsule hispid with long hairs, which fall off more or less when the fruit is ripe.

CROTON PENICILLATUM, *Vent.; H. B. K. Nov. Gen. & Sp.* 2, *p.* 84. Tampico; *Berlandier,* Nos. 752 and 2172. "Plant 3–4 feet high."

CROTON SYRINGÆFOLIUM, *H. B. K. l. c., p.* 67. Nos. 745 and 2165, *Berlandier.* No. 744 seems to be the same, with smoother leaves.

GYNAMBLOSIS MONANTHOGYNA, *Torr. in Marcy's Rep., p.* 295. Croton monanthogynum, *Michx. Fl.* 2, *p.* 215. C. ellipticum, *Nutt. Gen.* 2, *p.* 225, (excl. syn.) Engelmannia Nuttalliana, *Klotsch, l. c.* Argothamnia herbacea, *Spreng. syst.* 3, *p.* 848. Rocky places, Escondido Creek, Western Texas; *Bigelow.* (Nos. 441, 946, 1762, 2376 and 2532, *Berlandier.*) Nos. 649 and 2059, *Berlandier,* are very poor specimens of what may be a variety of this plant; but they differ in being more densely pubescent; the male flowers with 10–12 stamens, and at least some of the female flowers with three styles.

EREMOCARPUS SETIGERUS, *Benth. Bot. Sulph., p.* 53, *t.* 26. On the sea beach near San Diego, California; *Parry, Schott.* Near San Felipe; *Emory.* This plant begins to flower and even bear fruit when it has scarcely formed a stem and all its leaves are in roseate clusters, spreading flat on the ground.

APHORA HUMILIS, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 54. Gravelly hills along the Rio Grande from New Mexico downward to the Gulf; March to May; *Bigelow, Schott.* San Antonio, Texas; *Thurber.* (Nos. 643 and 1797, *Wright.*) Petals of the fertile flowers longer than the oblong glands. This and the next species differ from A. mercurialina and A. pilosissima in the fertile flowers bearing true petals besides the glands of the disk; the former alternate with the sepals; the latter opposite to them. The hairs, in all the species are simple, and those of the leaves and branches are fixed by the middle.

APHORA LÆVIS (Gray MSS.): glaberrima; caulibus e basi lignoso ramosissimis; foliis oblongis obtusis basi attenuatis; spicis axillaribus paucifloris folio multum brevioribus; petalis in flore masculo lanceolatis calycem paullo superantibus; in flore fœmineo lanceolatis glandulis linearibus emarginatis sub-duplo longioribus. Western Texas; *Wright,* No. 1798. Plant about a span

high. Leaves an inch long, tapering at the base into a short petiole. Spikes on short peduncles 4 to 5-flowered; commonly only the lowest flower pistillate. Very near the last species, but differing in being entirely smooth, and in long narrow emarginate glands of the disk.

APHORA LANCEOLATA, *Engelm. & Gray, l. c.* Serophytum lanceolatum, *Benth. l. c.* Sierra de la Nariz, Sonora; *Schott.* On the Gila; *Thurber.* Near A. humilis.

APHORA SERRATA (n. sp.): annua, humilis, pilosa; caule e basi ramoso; foliis oblongis basi in petiolum brevem attenuatis serratis; racemis androgynis paucifloris; floris masculi petalis calyce longioribus, foeminei petalis glandulis multo longioribus. Sandy plains near Fort Yuma, California; *Schott.* On the Rio Gila; *Parry.* Stems moderately branching, 3–6 inches long. Leaves ¾–1 inch long, ovate, or elliptical-oblong, obtuse or acute, denticulate-serrate. Clusters or short racemes axillary, 4–5-flowered; one or two of the flowers fertile, the others staminate. Petals of the staminate flowers rhombic-lanceolate, acuminate. Stamens 10, in 2 series, the filaments united into a slender column, at the base of which are 5 oblong erect glands. Fertile flowers 5-petalled, with 5 linear short glands alternating with the petals. Ovary trigastric, very hispid; styles deeply 2-parted; the divisions linear. Seed the size of a large pin-head, globose-obovate, gray, corrugated.

We have incomplete specimens (with staminate flowers only) of an allied species, or a variety of this plant, collected by Mr. Schott, on the Sierra del Tule, Sonora. It is much larger than A. serrata; the branches are quite smooth, and the oblong remotely denticulate leaves (1–2 inches long) are only sparsely hirsute. The racemes, or spikes, are axillary, 8–10-flowered, on peduncles about as long as the petioles. Segments of the calyx narrowly lanceolate. Petals 5, rhombic-lanceolate, purple. Stamens 10, in two series, one above the other; the filaments united into a column, with 5 oblong glands at the base. Another allied species, or probably variety, was found by Mr. Blodgett, in dry places, at Key West. It seems to be a prostrate annual, slightly hirsute, with ovate-oblong acute sub-sessile leaves, which are either denticulate-serrate, or nearly entire. Clusters 4–5-flowered. Petals of the staminate flowers oblong, a little exceeding the calyx. Fertile flowers 5-petalled, the petals ovate, half the length of the calyx. Glands very short and emarginate. Seed sub-globose, reticulate-corrugate.

APHORA MERCURIALANA, *Nutt. in Amer. Phil. Trans.* (*n. ser.*) 5, *p.* 174. Serophytum Drummondi, *Benth. Bot. Sulph. p* 53. Western Texas; *Wright.* (No. 2166, *Berlandier.*)—Var. PUMILA: nana, glabrescens, e basi ramosa; floris masculi petalis calyce paulo longioribus. Springs near Eagle Pass, on the Rio Grande; *Bigelow.* The variety is woody at the base, as in the ordinary form. The stem is only 4–6 inches long. Leaves (in dried specimens) more or less tinged or clouded with purple.

APHORA PILOSISSIMA. Serophytum pilosissimum, *Benth. l. c.* Southern Texas. (*Berlandier*, No. 2566.) This is the same as No. 322 of Drummond's third collection of Texan plants. Engelmann and Gray incorrectly refer this species to A. mercurialina, *Nutt.*

MOZINNA SPATHULATA, *Orteg. Dec.* 8, *p.* 105, *t.* 13. Var. SESSILIFLORA, *Hook. Ic.* 4, 357. Gravelly hills and mountain sides, western Texas, Chihuahua, Coahuila, and Nuevo Leon; flowering throughout most of the season. Near Matamoras; *Berlandier*, No. 3210. (No. 1812, *Wright.*) An erect shrubby plant, with nearly simple rather stout branches. Leaves 1–2 inches long, varying from linear to obovate-spatulate, and from obtuse or emarginate to acute. Flowers white, in small fascicles, growing, with the leaves, from short wart-like spurs. Fruit ovate, acute, often (by abortion) 1-seeded, the thin papery endocarp separating from the exocarp. Seed the size of a large pea, glabrous. All the species of this genus are called by the Mexicans

Sangre de Drago. Dr. Gregg, who found the present species in Chihuahua and other parts of Mexico, says it is astringent, and is employed by the natives as a remedy for sore gums and loose teeth. Mr. Schott found on the Sierra del Tule and Tinaja Alta, in Sonora, incomplete specimens of a Mozinna, which is probably a variety or state of M. spathulata. The leaves are about one-third of an inch long, obovate-cuneate, obtuse or emarginate, and the inflorescence is more expanded, so as to be somewhat paniculate. The fertile flowers were not collected.

MOZINNA CANESCENS, *Benth. Bot. Sulph. p.* 52, *t.* 25. Near Quitobaquata, Sonora, August; *Schott.* Our specimens are with staminate flowers only. I fear this is not sufficiently distinct from M. cordata, *Ort.*

MOZINNA CARDIOPHYLLA (n. sp.): foliis late cordatis acuminatis petiolatis crenato-dentatis; floribus masculis paniculatis. Near Tucson and Sierra Verde, Sonora, June; *Schott.* Plant glabrous, apparently 1–2 feet high. Leaves about an inch long, broadly cordate, rather coarsely crenate-toothed. Flowers nearly as in the two other species; only the staminate known.

CNIDOSCOLUS STIMULOSUS, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 26. C. Michauxii, *Pohl.* fide *Klotsch.* Jatropha stimulosa, *Michx. Fl.* 2, *p.* 216; *Ell. Sk.* 2, *p.* 649. Sandy places along the lower Rio Grande and westward to Sonora. (Nos. 1071 and 2501, *Berlandier.*) Variable in the size and outline of the leaves.

CNIDOSCOLUS ANGUSTIDENS (n. sp.): herbaceus, pilis urentibus hispidus; foliis ad medium 3–5-lobatis, lobis grosse inciso-dentatis, dentibus angustis elongatis acutisimis macronato-setaceis; floribus cymosis, centrali fœminei; calycis laciniis tubo subæquantibus. Santa Cruz, &c., Sonora; *Thurber, Schott.* (No. 1809, *Wright.*) Plant one to two feet high, more or less hispid with stinging hairs. Leaves remarkable for the long narrow salient teeth, which terminate in a rigid bristle; the lamina sometimes nearly smooth, but the petiole always hispid. Flowers as large as in C. stimulosus, but the tube of the petaloid calyx much shorter. Stamens 10; the filaments monadelphous about half their length, in two series of five each; the interior about one-third longer than exterior. At the base of the column are five small sessile glands.

JATROPHA MULTIFIDA, *Linn. Sp. p.* 1429; *H. B. K. Nov. Gen. & Sp.* 2, *p.* 105. J. macrorhiza, *Benth. Pl. Hartw. p.* 8? Plains along the Rio Grande from the Presidio del Norte downward to Neuvo Leon, and westward to Sonora, May–July. (No. 1808, *Wright.*) Plant about a foot high, herbaceous from a thick root or rhizoma. Leaves 3–5-lobed, the lobes oblong-lanceolate, laciniate and toothed, the teeth very acute and pointed with a bristle. Stipules deeply laciniate with subulate segments. Flowers in terminal cymes, the alar one of the primary usually fertile, the others staminate. Bracts ciliate. STAMINATE FL. Calyx deeply 5-parted; the segments laciniate-toothed. Corolla white, about twice as long as the calyx; segments obovate-spatulate. Stamens 8, monadelphous below, 3 of them longer than the other 5; the column with 5 erect cuneate emarginate glands at the base. FERTILE FL. Calyx and corolla nearly as in the staminate, except that the segments of the former are more laciniate. Style 3-parted nearly to the base; the divisions 2-cleft at the summit. Capsule about half an inch in diameter, nearly smooth, (granular when dry.) Seeds oblong, light brown with purple spots. Mr. Thurber informs us that the Mexicans know the seeds of this species to be purgative.

JATROPHA BERLANDIERI (n. sp.): glabra; foliis radicalibus longissime petiolatis glaucis palmatim 5–7-partitis, segmentis oblongis vel obovatis laciniato-dentatis vel pinnatifido-incisis; calycis segmentis ovatis integris corolla multo brevioribus; floribus masculis 8-andris. On the Lower Rio Grande; *Wright*, No. 651. Plains near Eagle Pass and Piedra Pinta; *Bigelow, Schott.* Monterey, Neuvo Leon; *Dr. Edwards.* (No. 1810, *Wright.* No. 2060 and 3124,

Berlandier.) Stem about a foot high, from a large oblong-conical starchy root. Leaves divided nearly to the base, the laciniæ often linear and very narrow; petioles 2–6 inches long. Flowers in terminal cymes, the alar one only fertile. Corolla purple; the segments obovate-oblong. Stamens monadelphous only near the base, 5 of them a little shorter than the other three; anthers linear, elongated: 5 glands at the base of the column. Styles short, united below; stigmas somewhat thickened, 2-lobed.

JANIPHA LOEFLINGII, *H. B. K. Nov. Gen. & Sp.* 1, *p.* 107. Jatropha Janipha, *Linn.* Ringgold Barracks, lower Rio Grande, June; *Schott.* Stems slender, glabrous. Leaves deeply 3–5-lobed, the lowest lobes smallest and entire, the others (especially the middle one) more or less panduriform. Staminate flowers 8–15 in a terminal raceme; the pedicels scarcely one line long; calyx tubular and at length salverform; the segments linear-oblong. Stamens 8; filaments free to the base; 5 of them shorter than the other; 5 small glands at the base of the filaments. Fertile flowers 2, at the base of the staminate raceme, their pedicels at length 6–8 lines long and reflexed. Calyx 5-parted to the base. Ovary globose, smooth, sometimes with 1 or 2 filaments bearing 1-celled anthers. Styles 3 short; stigmas dilated, cristate-lobed. Ripe fruit not seen. This is intermediate between J. Loeflingii and J. Yuquilla, and all are probably forms of one species.

JANIPHA MANIHOT, *H. B. K. l. c.*: var. ANGUSTILOBA: foliis 5-partitis, laciniis anguste lanceolato-linearibus integerrimis vel undulatis acutis. Santa Cruz and Tubac, Sonora, June—July; *Schott.* Near Monterey, Neuvo Leon; *Gregg.* No. 1811, *Wright.* Plant smooth, 1–2 feet from a somewhat shrubby base, branching above. Leaves mostly 5-parted; the segments 2–5 inches long and 1½–5 lines wide, usually somewhat undulate and sometimes approaching to panduriform. Stipules minute and subulate. Racemes 15–20-flowered; the 2 lowest flowers fertile, the others staminate. Calyx of the staminate flowers greenish-white, broadly campanulate, 5-lobed about half way down; the lobes oblong. Stamens 10; filaments distinct, 5 of them longer than the others; 5 glands at the base of the column. Calyx of the fertile flower 5-parted to the base. Pistil nearly as in J. Loeflingii. Fruit 3-lobed, the carpels 1-seeded. Seeds 4½ lines long, gray, mottled with dark purple. This differs from any form of J. Manihot in our herbarium, but it seems hardly a distinct species.

ACALYPHA CAROLINIANA, *Walt. Fl. Car. p.* 238; *Ell. Sk.* 2, *p.* 645. Ravines near Presidio del Norte, and near the Copper Mines, August—September; *Bigelow.* Annual. Staminate spikes axillary, 3–4 lines long; fertile ones terminal 2–3 inches long. Involucre cut into deep narrow segments. Capsule echinate with short soft spines. Very near A. polystachya of the West Indies.

ACALYPHA VIRGINICA, *L. Sp. p.* 1423; *Torr. Fl. New York*, 2, *p.* 173. Near the Copper Mines, New Mexico; *Bigelow.* No. 1817 and 1818, *Wright.* Differs somewhat from the eastern plant in the longer spikes and the more foliaceous terminal bracts.

ACALYPHA GRACILENS, *Gray, Man. Bot. ed.* 2, *p.* 390. Western Texas, *Wright.* More common southward and westward than the last.

ACALYPHA PHLEOIDES (*Cav.?*): suffruticosa; foliis ovatis subsessilibus serratis; spicis terminalibus solitariis androgyonis superne masculis inferne fœmineis; involucris 5-dentatis. A. phleoides, "*Cav. Ic.* 6, *p.* 48, *t.* 569, *f.* 2;" *ex Pers. Syn.* 2, *p.* 581. Hill sides, western Texas, Chihuahua, Cohahuila, Sonora, &c., April—July. No. 1815 and 1816, *Wright.* Stem apparently prostrate with erect hairy branches about a foot high. Leaves an inch long, rather acute at both ends, a little hairy above and underneath. Stipules subulate, very small. Spikes terminating the branches, 1–2 inches long, the summit usually staminate and much more slender than the fertile

portion. Bracts of the fertile flowers coarsely and acutely 5-toothed, sparingly ciliate with rigid hairs. Capsule hispid at the summit. According to Dr. Gregg this plant is used by the Mexicans as a wash for sore gums and loose teeth, and as an application to ulcers. It is doubtful whether this is A. phleoides, as that species is said to be an annual. Our plant seems to be nearly allied to A. prunifolia, but that also is described as an annual.

ACALYPHA HEDERACEA (n. sp.): e caudice lignoso multicaulis, molliter incano-pubescens seu villosa; foliis orbiculari-reniformibus longe petiolatis crenato-dentatis; spicis dioicis (rarissime monoicis) terminalibus pedunculatis, stamineis gracilibus fœmineis brevibus crassis, bracteis obtuse 9–10-dentatis. Damp places, valley of the Pecos; *Bigelow*. Nouvo Leone and Chihuahua, *Gregg*, *Edwards*. May—September. (No. 648, 1813 and 1814, *Wright*. No 473, *Lindheimer*.) Plant slender, prostrate, branches 6–15 inches long. Leaves 6–10 lines in diameter, mostly broader than long, truncate or cordate at the base. Staminate spikes 6–10 inches long; the peduncle often 1–2 inches long. Fertile spikes half an inch long. Bracts cucullate; Fruit hispid.—In one of Mr. Wright's specimens (No. 1813) there are sessile axillary few-flowered fertile spikes, and others that are androgynous, consisting of a short pedunculate staminate spike with a single fertile flower at the base.

ACALYPHA RADIANS (n. sp.): e basi suffruticosa multicaulis, pilis longis patentissimis villosa; foliis longe petiolatis orbiculari-reniformibus inciso 7–13-fidis, lobis sublinearibus; spicis dioicis terminalibus pedunculatis, stamineis oblongo-linearibus, fœmineis crassis; bracteis obtuse 9–10-dentatis. Western Texas, especially along the lower Rio Grande, and in the adjoining Mexican States. (No. 251, Coll. II,) Texas, *Drummond*. No. 649, *Wright*. No. 636, 1070, 2046, and 2500, *Berlandier*) This is certainly very near the last, but I have not seen intermediate forms. It it is easily distinguished by its hairiness, and the radiately lobed leaves.

TRAGIA URTICÆFOLIA, *Michx. Fl.* 2, *p.* 176; *Ell. Sk.* 2, *p.* 564. T. betonicæfolia, *Nutt. l. c. p.* 173. T. brevispica, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 54; *Scheele in Linnæa*, 25, *p.* 486. Rocky ravines and hill sides, New Mexico, and western Texas, along the Rio Grande to the Gulf. (No. 307, Coll. II. Texas, *Lindh.* No. 260, Coll. III. Texas, *Drummond*. No. 1793, *Wright*.) No. 647 of Wright's earlier collection in the same plant with the flowers and fruit in an abnormal state. I can find no sufficient characters for distinguishing this plant from T. urticæfolia, *Mx.* The stems are at first upright, but at length prostrate or sometimes even a little twining. The length of the spikes is very variable. In specimens from Arkansas the fertile flowers have the calyx 6-petalled, and the staminate 4–5-sepalled, 4–5-androus. The stems are somewhat woody at the base.

TRAGIA URTICÆFOLIA, var.? LACINIATA: foliis pedatim 3-partitis, laciniis pinnatifidis, intermedio longiore. Sonora, Mexico, *Thurber*. No. 1795, *Wright*. Stem apparently prostrate, 12-15 inches long, paniculately branched, hirsute. Leaves 1–1¼ inch long, the lower ones on short petioles, upper nearly sessile, pedately divided to the base, pinnatifidly cut into acute segments or teeth; the lateral lobes sometimes unequally 2-cleft. Racemes terminating the short branches, few-flowered, the lowest flower fertile. Calyx and fruit as in the ordinary form, *Fruit*. A remarkable variety, approaching (by the description) T. cannabina. Mr. Schott collected in the northwestern part of Sonora specimens of a Tragia that seems intermediate between T. urticæfolia and this plant. The leaves are oblong-ovate and coarsely toothed, and part of them are 2-lobed at the base or somewhat halberd-form, showing the tendency to become pedate.

TRAGIA RAMOSA, *Torr. in Ann. Lyc. New York*, 2, *p.* 245. T. angustifolia, *Nutt. l. c.* T.

scutellariæfolia, *Scheele, l. c.* Gravelly hills of the Limpio; *Bigelow.* Ravines of the Organ mountains, April; *Parry.* On the upper Rio Grande, New Mexico; *Fendler*, No. 776. Perhaps only a var. of the last. It differs chiefly in being much smaller and erect, with the leaves scarcely at all cordate. Var.? LEPTOPHYLLA: foliis linearibus integris vel remote denticulatis.—Near Howard's Springs; *Bigelow;* No. 1796, *Wright.* Plant woody at the base, about a span high, and branched from the base. Stem and branches sparingly hirsute. Leaves 1–1½ inch long and 1–2 lines wide. Spikes few-flowered; the lowest flowers fertile. Flowers as in T. ramosa, etc.

TRAGIA URENS, *Linn. Sp. p.* 1391; *Ell. Sk.* 2, *p.* 564. Hills on the lower Rio Grande; *Schott.*

TYRIA MYRICÆFOLIA, *Scheele in Linnæa*, 25, *p.* 581. Rocky hill sides near the Pecos and Live Oak creek, also on the Flounce mountains, etc.; western Texas and Chihuahua; *Bigelow, Schott.* San Felipe, California; *Parry.* No. 1806 and 1807, *Wright.* An irregularly branched homely shrub, 3–10 feet high, of a grayish green color, clothed with a minute stellate pubescence. Sterile flowers on short pedicels which are aggregated upon spurs or short branches and articulated at the base. Sepals mostly 3, sometimes 4. Stamens 3–20, the filaments distinct, with minute alternate capitate pedicellate glands at their base. No abortive ovary. Fertile flowers sessile. Fruit tricoccous or by abortion dicoccous.

SAPIUM? ANNUUM (n. sp.): annuum, humile; foliis rhombeo-oblongis acuminatis basi attenuatis prominenter trinervibus spinuloso-dentatis rigidulis eglandulosis. Stillingia spinulosa, *Torr. in Emory's Rep. p.* 151. In the sandy desert west of the Colorado, California; *Major Emory.* Near Fort Yuma; *Schott.* Var. DENTATUM: foliis oblongis vel obovato-oblongis obtusis vel acutiusculis membranaceis acute dentatis, dentibus inermibus, venis inconspicuis. Wet ravines, Eagle Pass, Lower Rio Grande; *Bigelow, Schott.* Valley of the Almo; *Parry.* Near Monterey, Neuvo Leon; *Dr. Edwards & Major Eaton.* These two forms differ considerably, but they probably belong to one species. They are both undoubtedly annual.

SAPIUM SYLVATICUM. Stillingia sylvatica, *Linn. Mant. p.* 126; *Ell. Sk.* 2, *p.* 560. Var. LINEARIFOLIA: foliis anguste-linearibus argute serrulatis, serraturis glandulosis. Ravines on the San Pedro river and on limestone rocks higher up on the Rio Grande; *Schott, Bigelow.* Leaves 2½–3 inches long, 2–3-lines wide, somewhat coriaceous. Spikes androgynous, 1–2 inches long, 2–4 of the lowest flowers fertile. Staminate flowers 5–10 on short pedicels under each scale or involucre. Calyx hemispherical, 2-lipped; the border slightly crenulate. Stamens 2: filaments united at the very base.

SAPIUM SALICIFOLIUM, *H. B. K. Nov. Gen. & Sp.* 2, *p.* 65. Between Rayon and Ures, Sonora; *Thurber.* "A shrub 10–12 feet high with somewhat erect and slender branches, and deep green foliage." Leaves 1½–2 inches long, and 3–4 lines wide, somewhat coriaceous, rather acute, remotely denticulate, the upper side (when dry) of a verdigris green color, often with 2 minute glands at the base. The specimens are in fruit. The capsule is solitary and apparently axillary, on a short peduncle, smaller than in S. sylvatica, but in other respects similar, and without any remains of the staminate spike. On the Sierra de la Nayoz, in Sonora, Mr. Schott gathered specimens of what seem to be the same plant. The leaves are similar in form, but a little wider, more membranaceous and rather obtuse, or sometimes even emarginate. The staminate spikes are without any fertile flowers at the base. There are 10–20 sessile flowers under each scale or involucre. The calyx is manifestly 2-lipped, and the stamens seem to be constantly two, the

filaments of which are scarcely united at the base. Fertile flowers not seen. Fruit solitary and resembling that of S. salicifolium, except in being larger. The plant seems to be dioecious.

The genera Sapium and Stillingia are, we think, very properly united by Klotsch. Long ago Ad. Jussieu remarked (*Euphorb. p.* 50) that they were scarcely distinct and ought perhaps to form one genus. The calyx of the staminate flowers is the same in both, although it is described as tubular in the latter. The number of staminate flowers under a single bract or involucre is not a sufficient distinction. There are several in S. sylvaticum and S. salicifolium; but in S. annuum and S. ligustrinum they are solitary.

SIMMONDSIA CALIFORNICA, *Nutt. in Hook. Lond. Jour. Bot.* 3, *p.* 400, *t.* 16; (TAB. XLIX.) Dry hills along the Gila and westward to San Diego; not uncommon in various parts of southern California. Nuttall did not see the fruit. This is about three-fourths of an inch long, ovate and obtusely triangular, abruptly pointed, and somewhat resembles the gland of an acorn. At maturity it splits into 3 valves; the dehiscence being loculicidal. It usually contains but a single seed, which is conformed to the cavity of the pericarp. The embryo is wholly destitute of albumen. The cotyledons are very thick and fleshy, and they cohere together, so that they only separate after considerable boiling. The radicle is minute and superior. The nuts have somewhat the flavor of filberts, but the after-taste is rather nauseous, and they are apt to cause purging. Mr. Nuttall thinks this genus is very clearly allied to Garrya, but it differs in several important characters. Lindley places it, without a remark, in Euphorbiaceæ, and we are inclined to follow him, notwithstanding the absence of albumen.

Suborder BATIDEÆ.

BATIS MARITIMA, *Linn.; Torr. in Smithson. Contrib.* 6, *p. t.* 11. On the beach, at Brazos Santiago; *Schott.*

BATIS CALIFORNICA, *Torr. l. c.* Salt marshes near San Diego, California; *Parry.* We have received no more specimens of this plant since it was first described, and are by no means certain that it is specifically distinct from B. maritima.

URTICACEÆ.

URTICA URENS, *Linn. Spec.* 2, *p.* 284; *Miquel in Mart. Fl. Bras. fasc.* 12, *p.* 195, *t.* 67. In the streets of Monterey, California, where it has manifestly been introduced, May; *Parry.* Wet ravines near the Organ mountains, New Mexico; *Bigelow.*

URTICA PURPURASCENS, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 169; *Gray, Man. ed.* 2, *p.* 398. San Antonio, Texas; *Thurber.* Near Eagle Pass on the Rio Grande; *Bigelow.* It is commonly simple, but Dr. Bigelow's specimens are branching from the base.

URTICA GRACILIS, *Ait. Hort. Kew* 3, *p.* 341; *Gray, l. c.* Banks of the Limpio, July; *Bigelow.* California; *Rev. A. Fitch.* Stem 4–5 feet high. Leaves often ovate and sometimes slightly cordate, coarsely toothed.

BOEHMERIA CYLINDRICA, *Willd. Sp.* 4, *p.* 340. Banks of streams and wet thickets, western Texas.

PARIETARIA DEBILIS, *Forst.* S. FLORIDANA, *Weddell, Monogr. Urtic. p.* 316. P. Floridana, *Nutt. Gen.* 2, *p.* 208; *Ell. Sk.* 1, *p.* 576. Rocky places along the upper Rio Grande and in Sonora, March—May. (No. 1861, *Wright.*) The leaves vary from nearly orbicular to ovate-

oblong. The narrower leaved forms approach P. Pennsylvanica. Found in many parts of the world, but not in Europe.

HUMULUS LUPULUS, *Linn. Sp.* 2, *p.* 1028; *Torr. Fl. N. York,* 2, *p.* 225, *& in Sitgr. Rep. p.* 173 H. Americanus, *Nutt. Pl. Gamb. in Jour. Acad. Phil. n. ser.* 1, *p* 181. Banks of the Mimbres; *Bigelow.* (No. 1860, *Wright*)

MORUS RUBRA, *Linn l. c. p.* 986; *Michx. f. Sylv.* 2, *t.* 116. Common in western Texas, New Mexico, and Chihuahua; often flowering and bearing fruit when a low shrub. (No. 1859, *Wright.*) Nos. 2498 and 2416, *Berlandier.* The leaves are commonly about two inches long, but those of vigorous shoots are sometimes 11 inches long and 8 inches in diameter.

CELTIS OCCIDENTALIS, *Linn. Sp.* (*ed.* 2) 2, *p.* 1478; *Michx. f. Sylv.* 2, *t.* 114; *Torr. Fl. N. York,* 2, *p.* 167. C. crassifolia, *Lam.* Western Texas and New Mexico. We quite agree with Dr. Gray in regarding C. crassifolia as a mere variety of this species. Some of our specimens show a transition to C. Mississippiensis, *Bosc,* (C. integrifolia, *Nutt*,) which Dr. Gray suspected was not distinct.

CELTIS (MOMISIA) PALLIDA (n. sp.): ramis incano-puberulis; spinis subgeminis rectis; foliis ovatis vel ovato-oblongis pauci serratis integerrimisque puberulis crassiusculis breviter petiolatis basi acutiusculis raro leviter cordatis; cymulis polygamis 3–5-floris petiolo paullo longioribus; bacca ovata laevi glabra. (TAB. L.) Common in western Texas and along the Rio Grande, from Fort Duncan to the Gulf, and west to Magdalena in Sonora. It is called Grangeno in Neuvo Leon. (No. 1858, *Wright;* No. 3021, *Berlandier.*) A shrub 6–10 feet high, with numerous flexuous spreading branches. Thorns from 2 or 3 lines to an inch in length. Leaves 8–14 lines long, mostly acute, 3-nerved, minutely pubescent and somewhat scabrous on both sides. Flowers small, white; the lower ones of the cymule mostly male, with a rudimentary pistil; the terminal one perfect. Styles thick, divaricate, cleft nearly half their length, the undivided portion rather shorter than the ovary. Berry about three lines long, orange, yellow, and red, with an acid pulp, which is edible but rather astringent. This species seems to be nearest the Brazilian C. orthocanthos, *Planch.*

ULMUS CRASSIFOLIA, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 169. U. opaca, *Nutt. Sylv.* 1, *p.* 35, *t.* 11. On the banks of rivers, from San Antonio, Texas, to the Pecos river; *Schott. Thurber.* (No. 1857, *Wright;* No. 346, Coll. II, Texas, *Drummond;* No. 2546, *Berlandier.*) Mr. Nuttall, in his Sylva, has overlooked his much earlier name and description of this species.

ULMUS ALATA, *Michx. Fl.* 1, *p.* 173; *Michx. f. Sylv.* 2, *t.* 127. Near Eagle Pass on the Rio Grande; *Bigelow.*

SAURACEÆ.

ANEMOPSIS CALIFORNICA, *Nutt. in Tayl. Ann. Nat. Hist.* 1, *p.* 136; *Hook. & Arn. Bot. Beechey, p.* 390, *t.* 92. Wet places, San Luis Rey, California; *Parry.* Western Texas, New Mexico, and Chihuahua, April—July.

CERATOPHYLLACEÆ.

CERATOPHYLLUM DEMERSUM, *Linn. Sp. p.* 1409. In running water, near the southern boundary line of Upper California; *Parry.*

BETULACEÆ.

ALNUS VIRIDIS, *DC.* Near San Diego, California; *Parry.* Our specimens are without fruit. Dr. Parry informs me that this is a common species in California, and that it sometimes becomes

a tree 40 feet in height, with a trunk 8 inches in diameter. We have specimens of another Alnus, collected in California by *Rev. A. Fitch*, which seems to be A. rhombifolia, *Nutt.* It differs from A. serrulata in the coarse teeth of the leaves, and from all other North American species in the long acute base of the leaves.

ALNUS OBLONGIFOLIUS (n. sp.): ramis glabris nitidis; foliis oblongo-lanceolatis utrinque acutis subduplicato-serratis supra glaberrimis subtus minutissime pubescentibus utrinque viridibus; nuculis apteris. Banks of the Mimbres and near Santa Barbara, New Mexico. (No. 1864, *Wright.*) A tree 30 feet high. Leaves 2½–3½ inches long and 1–1½ inch wide; unequally serrate, serratures glandular at the tip; petiole about one-third as long as the lamina. Catkins somewhat paniculate, ovate. Nutlets orbicular-obovate, without any trace of a wing.

SALICACEÆ.

SALIX LUCIDA, *Muhl.* Var. ANGUSTIFOLIA, *Anders. Salices Bor.-Amer. in Proceed. Amer. Acad.* 4. S. lasiandra, *Benth. Pl. Hartw. p.* 335; *Torr. Bot. Whippl. Rep. p.* 138. Mountains of California, (the precise station not recorded;) *Parry.* "A straggling shrub."

SALIX WRIGHTII, *Anders. l. c.* Borders of the Upper Rio Grande, in western Texas and Chihuahua; also near Lake Santa Maria. (No. 1877, *Wright.*) A tree 15 to 25 feet high.

SALIX LONGIFOLIA, *Muhl.; Anders. l. c.* Between the Pecos and the Rio Grande, and westward to the lower Rio Gila.

I have not ventured to name five or six other willows of the Mexican Boundary collections. Mr. Anderson is preparing a more complete account of this exceedingly difficult genus. He has shown that many of our Salices, until recently supposed to be different from any in the Old World, are identical with European species, or only varieties of them. He desires contributions of specimens from our botanists, that he may be able to perfect his contemplated work.

POPULUS TRICHOCARPA, *Torr. in Hook. Ic.* 9, *t.* 878. Borders of Santa Clara river, near Buenaventura; *Parry.* A tree 30 feet high, with smooth bark. This species is easily distinguished by the hairy fruit.

POPULUS MONILIFERA, *Ait.; Michx. f. Sylv.* 1, *p.* 116, *t.* 96, *f.* 2. Borders of streams from western Texas and New Mexico to California. This is the ordinary cotton-wood of the West.

POPULUS TREMULOIDES, *Michx. Fl.* 2, *p.* 243; *Michx. f. Sylv.* 1, *p.* 125, *t.* 99, *f. c.* Hills near the Copper Mines, in fruit, June; *Bigelow.* (No. 1870, *Wright.*)

POPULUS BALSAMIFERA, *L.; Michx. f. Sylv.* 2, *p.* 121, *t.* 98, *f.* 1. Banks of the Mimbres; *Bigelow.*

POPULUS ANGUSTIFOLIA, *James; Torr. Ann. Lyc. N. York*, 2, *p.* 249; *Nutt. Sylv.* 1, *p.* 52, *t.* 16. Near the Copper Mines of New Mexico and on the banks of the Mimbres; *Bigelow.* This is the Narrow-leaved Poplar of Lewis and Clark's Travels. It is No. 817 of Fendler's N. Mexican Collection.

PLATANACEÆ.

PLATANUS RACEMOSA, *Nutt. in Audubon's Birds*, 1, *t.* 362, & *Sylv.* 1, *p.* 47, *t.* 15; *Newberry Bot. Williamson & Abbott's Rep. p.* 33, *f.* 10. P. Mexicana, *Moric.* P. Californica, *Benth.* Borders of streams near San Diego, etc., California; *Parry.* Guadalupe Cañon, Sonora; *Thurber.* A large tree, sometimes 50–60 feet high. Hartweg states that in California he has seen it 80 feet high and 12 feet in circumference.

PLATANUS OCCIDENTALIS, *L. Sp.* 2, *p.* 999; *Michx. f. Sylv.* 1, *t.* 63. Devil's River valley, western Texas; probably the western limit of this species; *Bigelow.*

GARRYACEÆ.

GARRYA ELLIPTICA, *Lindl. Bot. Reg. t.* 1686. Sandy places near Monterey, California; *Parry.* A shrub, seldom more than 5 or 8 feet high. Both sexes occur in Dr. Parry's specimens.

GARRYA WRIGHTII, *Torr. Bot. Whipp. Rep. p.* 136. Hills near the Copper Mines, New Mexico, abundant; July.

GARRYA LINDHEIMERI, *Torr. l. c.* Western Texas and New Mexico; *Wright.* El Paso; *Thurber.*

JUGLANDACEÆ.

JUGLANS RUPESTRIS, *Engelm.*; *Torr. Bot. Sitgr. Rep. p.* 171, *t.* 15. J. pyriformis, *Liebm. Vidensk. Meddel. Kjobenh. for* 1850, *p.* 80? Common on the gravelly borders of streams in western Texas from Devil's river to the Pecos and Limpio; also at the Copper Mines. (No. 1029 and 2459, *Berlandier.*) The *var.* MAJOR, *Torr. l. c. t.* 16, seems to pass gradually into the small-fruited form. They are found together, and the variety occurs also in Sonora. At San Fernando, beyond Los Angeles, Dr. Parry found a Juglans in flower, which is probably a variety of J. rupestris. The leaflets are 11–13, ovate-oblong, rather obtuse and sharply serrate. He did not obtain the fruit.

CARYA OLIVÆFORMIS, *Nutt. Gen.* 2, *p.* 221. Juglans oliviæformis, *Michx. Fl.* 2, *p.* 192; *Michx. f. Sylv.* 1, *t.* 32. Western Texas, near the Rio Grande; *Bigelow.* The leaflets are only 9–11, and the nuts much shorter than in the ordinary Pecan.

CUPULIFERÆ.

CASTANEA CHRYSOPHYLLA, *Dougl. in Hook. Fl. Bor.-Amer.* 2, *p.* 159; *Hook. Lond. Jour. Bot.* 1843, *t.* 16. Near Monterey, California, where it is a bush, only 2–3 feet high. At Santa Cruz, in the same State, it becomes a tree, 50 feet high. The nuts are small, like those of the beech, but rounded on the angles.

QUERCUS GAMBELII, *Nutt. Pl. Gamb. l. c. p.* 179; *Torr. Bot. Sitgr. Rep. p.* 172; *Liebm. Querc. Neo.-Mex. & Calif. p.* 169.* Mountains near the Copper Mines, New Mexico; *Bigelow.* Liebmann refers to this species, No. 806, 809 and 810 b. of Fendler's New Mexican Collection.

QUERCUS LOBATA, *Née in Anal. de Cien. Nat.* 3, *p.* 270, (fide *Liebm. l. c. p.* 172.) Q. Hindsii, *Benth. Bot. Sulph. p.* 55; *Torr. Bot. Whipp. Rep. p.* 138; *Newberry in Pacif. R. R. Rep. Bot. p.* 27, *fig.* 5. Near Monterey and in other parts of California. A fine tree, allied to the white oak of the Atlantic States, remarkable for its usually long acorns. Q. lobata is only a form with shorter acorns.

QUERCUS TINCTORIA, var.? CALIFORNICA, *Torr. Bot. Whippl. Rep. p.* 138. Q. rubra, *Liebm. in Benth. Pl. Hartw. p.* 337, non *Linn.* Q. Kelloggii, *Newberry, l. c. p.* 28, *f.* 6. On mountains east of San Luis Rey and San Diego, California; *Parry.* A middle-sized tree. It is called black oak in California. The leaves when young are very downy underneath, and somewhat so on the upper surface; but they are nearly glabrous late in the season. Sometimes the acorn is short and half immersed in the cup.

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QUERCUS COCCINEA, var.? MICROCARPA: foliis oblongis profunde sinuato-pinnatifidis utrinque glabris nitidisve, sinubus obtusis, lobis (utrinque 2–3) parce dentatis, dentibus setaceo-acuminatis; fructibus solitariis geminisque, glande oblongo-ovata apiculata. Rocky ravines near the mouth of the Pecos, and on the Limpio; *Bigelow*. Oak Creek, Texas; *Schott*. Differs from the common state of Q. coccinea in the considerably smaller and less lobed leaves, in the acorns being scarcely one-third as large, the cup not turbinate, and the gland longer in proportion to its breadth.

QUERCUS NIGRA, *Linn.*; *Michx. f. Sylv.* 1, *t.* 20; *Torr. Fl. N. York*, 2, *p.* 188, *t.* 105. Medina Creek, above San Antonio, Texas; *Parry*. This appears to be the western limit of the *Black-Jack Oak*.

QUERCUS OBTUSIFOLIA, var.? BREVILOBA: foliis subcoriaceis obovato-oblongis basi cuneatis, lobis brevibus obtusis supra viridibus subtus pallidis pubescentibus; fructibus sessilibus solitariis vel geminis, cupula depressa hemispherica, glande oblongo-ovato obtusa.—Mountain gorges near Howard's Springs, western Texas; *Bigelow*. We refer this oak to Q. obtusifolia with much doubt, but it seems more nearly allied to that species than to any other. It differs, however, in its leaves being much smaller and far less lobed, more coriaceous and apparently evergreen. The acorns, too, are smaller and the cup more shallow.

QUERCUS UNDULATA, *Torr. in Ann. Lyc. N. York*, 2, *p.* 248, *t.* 4; *& in Marcy's Rep. p.* 297. Q. Fendleri, *Liebm. l. c. p.* 170.—New Mexico, near the Rio Grande. (No. 805 and 807, Fendl. N. Mex. Coll.)

QUERCUS VIRENS, *Ait.*; *Michx. f. Sylv.* 1, *p.* 57, *t.* 12. Moist woods on the Gulf coast from the Brazos to the Rio Grande, also along the latter river as high as the Pecos and Live Oak Creek. At a distance from the coast it is commonly a shrub 4–6 feet high. The leaves vary from narrowly oblong to broadly ovate. On old trees they are mostly entire, but on young shoots they are often sharply toothed.

QUERCUS EMORYI, *Torr. in Emory's Rep. p.* 152, *t.* 9. Q. pungens, & Q. hastata, *Liebm. l. c. p.* 171. Near the mouth of the Pecos and on the Limpio, Texas; *Bigelow, Parry*. Chihuahua; *Thurber*. Sonora; *Schott & Capt. E. K. Smith*.—A widely spread shrubby evergreen oak, with neat foliage and very small acorns. The small-leaved oak of Frémont, quoted by Liebmann under his Q. chrysolepis, seems to be a variety of this species. No. 664, *Wright*, belongs to the form called Q. pungens by Liebmann, in which the leaves are more deeply toothed or lobed than in the normal state.

QUERCUS AGRIFOLIA, *Née in Ann. de Cienc. Nat.* 3, *p.* 281, fide *Liebm.*; *Hook. Ic.* 3, *t.* 377. Q. oxyadenia, *Torr. in Sitgr. Rep. t.* 17, *& Bot. Whippl. Rep. p.* 138. Common on the mountains of California, from the Upper Sacramento to the southern boundary line; *Parry*. East of San Diego Dr. Parry saw trees of this oak which were 30 or 40 feet high. When growing singly, it has a round top like the Live Oak, throwing out branches a few feet from the ground and extending 30 feet or more from the trunk.

QUERCUS OBLONGIFOLIA, *Torr. in Sitgr. Rep. p.* 173, *t.* 19. Q. grisea, *Liebm. l. c. p.* 171. Mountains of the Limpio, Texas (*Bigelow*), and westward to the range east of San Diego, California; *Parry*. In Texas and western New Mexico this oak is commonly a shrub 6–15 feet high; but in California it sometimes attains the height of 20 or 30 feet. It has pale bark and spreading branches. The acorns vary considerably in form. To this species I refer No. 665 and 1866, *Wright*.

QUERCUS CHRYSOLEPIS, *Liebm. l. c. p.* 173; *Benth. Pl. Hartw. p.* 336. Q. crassipocula, *Torr. in Pacif. R. Road Expl.* 6, *p.* 365, *t.* 9. Q. fulvescens, *Kellogg in Proceed. Calif. Acad. Nat. Sc.* 1, *p.* 67 & 71; *Newberry l. c. p.* 27, *f.* 5. Mountains of California, from Oregon to the southern boundary line. An evergreen oak, 30–40 feet high, with pale bark. The heart-wood is dark-colored, and it is said to be good timber. The acorns are often of great size and the cups extremely thick, as represented in my figure of Q. crassipocula, but sometimes not larger than those of the Live Oak (Q. virens). We adopt Liebmann's earlier name for this beautiful species.

QUERCUS DUMOSA, *Nutt. Sylv.* 1, *p.* 7? Near San Diego, California; *Parry*. A shrub, 5–8 feet high, and very densely branched. The leaves are sempervirent, ovate, and 8–10 lines long. Our specimens accord well with Nuttall's description; but he did not see the acorns. These are sessile, solitary and in pairs, about three-quarters of an inch long; the cup hemispherical; the gland ovate-oblong, tapering to a point and scarcely more than one-third of an inch in diameter at the base. Dr. Parry states in his notes, that the leaves are sometimes larger and oblong.

QUERCUS ACUTIDENS (n. sp.): foliis oblongis coriaceis basi acutiusculis vel cuneatis inequaliter grosse dentatis, dentibus cuspidatis pungentibus supra glabris nitidulis subtus pallidis minute tomentosis; fructibus sessilibus solitariis; cupula hemispherica, squamis incrassatis; glande oblongo-ovata. (TAB. LI.) Near San Luis Rey, California; *Parry*.—"Generally a low shrubby bush; but sometimes a tree 20 feet high." The leaves are 1½–2 inches long and 8–10 lines wide. The acorns are more than an inch long and much resemble those of the White Oak (Q. alba).

QUERCUS CONFERTIFOLIA, *H. B. K. Pl. Æquin.* 2, *p.* 53, *t.* 94? Near the Copper Mines, New Mexico; *Thurber*; No. 1869, *Wright*. Sierra del Pajarito, Sonora; *Schott*. San Francisco mountain; *Captain E. K. Smith*.—A small tree. Liebmann seems to have referred it to Q. cinerea, as he includes that species in his list of New Mexican Oaks (doubtless of Wright's collection) which he examined in the herbarium of Sir William Hooker, and Mr. Wright found no other Quercus in New Mexico resembling Q. cinerea. Our plant has thickly coriaceous, lanceolate, acute leaves, which are 3–4 inches long, and from three-quarters of an inch to nearly an inch broad. They are commonly entire and revolute on the margin, but occasionally show 1–3 minute teeth, nearly smooth and pale green above, very densely yellowish-tomentose underneath. The acorns are nearly sessile, solitary and in pairs; the cup hemispherical with broad, obtuse, pubescent scales, and the unripe acorn is ovate. Q. cinerea differs in its much thinner non-revolute leaves, and thin pale pubescence. The acorns also seem to differ, but we have not seen the ripe ones of Q. confertifolia.

RAFFLESIASÆ.

PILOSTYLES THURBERI, *Gray, Pl. Thurb. in Mem. Amer. Acad. n. ser.* 5, *p.* 326. (TAB. LII.) On a mountain near the Gila, June, parasitic on the branches of Dalea Emoryi; *Thurber*.

CONIFERÆ

EPHEDRA ANTISIPHILITICA, *Berland.; C. A. Meyer, Ephedr.* 101, *ex Endl. Syn. Conif. p.* 263. Western Texas, from the Nueces to the Rio Grande, and from Frontera to Eagle Pass, April, May. San Diego, California; *Parry*. Ranconado Pass, Cohahuila; *Thurber*. Between Mapami and Guajaquilla, Durango; *Gregg*, (No. 1882 and 1883, *Wright*.) The Mexicans call the plant

Tepopote and Cañatilla, and use a decoction of it as a remedy for gonorrhœa. It is a shrub about two feet high with numerous branches, the sheaths of which are short, 2–3-cleft, the divisions lanceolate or subulate, spreading or recurved, at length deciduous. Sterile aments opposite or aggregated at the nodes. Anthers mostly 4. Fertile opposite, 1–2-seeded. The sheaths of the ament mostly 4, deeply 2-cleft and somewhat fleshy. Seeds smooth, when in pairs flattened on the face, when solitary they are larger and obtusely triangular, nearly twice as long as the inner scales. Tube of the micropyle very obliquely truncated.

There are numerous specimens in the Mexican Boundary Collections, of an Ephedra, found at Frontera and near Doña Ana, which may be a distinct species, but I suspect it is an abnormal state of E. antisiphilitica. It is a shrub of 3 to 5 feet in height. The fertile aments are ovate-oblong, and instead of four decussating pairs of connate thickish, or at length succulent scales, there are from 16 to 20 very broad, entire, thin and membranaceous scales, which are distinct, contracted into a short stipe at the base, and irregularly inserted on the axis. They are at first loosely imbricated, but at length more or less spreading. The seed (immature) is ovate with a tapering point, and except the long obliquely truncated micropyle, is wholly covered with the scales.

Another Ephedra occurs at Fronteras, and it has also been found at Ojo de Vaca in Chihuahua, by Mr. Thurber. It resembles the one just noticed, but the scales, though equally numerous and arranged in the same manner, are smaller and less membranaceous. They are also minutely erose-serrulate. The seeds, however, are roughened with minute points which are sometimes disposed in short transverse rows, so that, unless pretty highly magnified, they look like wrinkles of the testa. The micropyle is conspicuously exserted beyond the scales. There are usually but two seeds in each fertile ament, but not unfrequently three. The arrangement of the scales of the fertile aments in these two Ephedræ is so much at variance with the character of the genus, that it seems most probable they are abnormal forms.

Pinus edulis, *Engelm. in Wisliz. Rep. p.* 88; *Torr. in Bot. Sitgr. Rep. p.* 173, *t.* 20, *& in Bot. Whippl. Rep. p.* 140. P. Fremontiana, *Gord. in Jour. Hort. Soc. Lond.* 4, *p.* 293, *cum ic. xyl.; excl. Syn. Endl. & Torr.* Mountains of western Texas, near the Rio Grande, New Mexico, Chihuahua, and Sonora. (No. 1889, *Wright;* No. 830, *Fendler;* New Mexico.) The cones and nuts greatly resemble those of the next species. The leaves are almost always in pairs, very rarely in threes. Gordon, in the work just quoted, refers this species to P. monophylla, *Torr. & Frém.*, the name of which, he says, was changed to P. Fremontiana by Professor Endlicher, (*Syn. Conif. p.* 183,) because that botanist having "afterwards examined more perfect specimens, found that the leaves were in twos and threes, and that the solitary leaves arose from Dr. Torrey's specimens being gathered from stunted plants." Now, we find that Endlicher in his Synop. Conif. has no remarks of this kind. His entire description is taken from mine in Frémont's 2d Report; but he regards what I call a single leaf, as consisting of two united leaves. Col. Frémont found extensive forests of the tree in his first expedition, as well as in his journey of 1853–'54. Dr. Bigelow also found it in Whipple's expedition on the mountains of California, but in consequence of an oversight it was not included in the Botanical Report of that expedition. The characters appearing to be so constant, I retain the species, and wait for additional observations on the plant in its native places of growth. It would be desirable, also, to test the constancy of the species by cultivation. Gordon's figure (l. c.) represents the ordinary state of P. edulis.

Pinus Llaveana, *Scheide & Deppe in Linnæa*, 12, *p.* 488. P. cembroides, *Newberry, in Pacif.*

Railroad Rep. 6, (*Bot.*) *p.* 44, *cum ic. xylog.* non *Zucc.* (TABLE LIII.) On the mountains east of San Diego; *Parry.* "A tree 30 or 40 feet high, and often 12 to 18 inches in diameter, with a round, even head. The young trees remarkably symmetrical, like some cedars, with the broad base resting on the ground, the trunk and branches being completely hidden by the dense foliage. The upper branches are usually loaded with cones." The leaves are mostly in fours, but sometimes in threes, and often in fives. They are crowded towards the summit of the branches, 1½ to 2 inches long, and a little curved. Cones about 2 inches long, globose-ovate, disposed near the extremity of the last year's growth, and are at a right angle to the branch. They are often somewhat gibbous, the convexity being upward. The scales are few, with the summit obtusely pyramidal. Seeds obovate, wingless, large for the size of the cone, with a thin fragile shell, and an edible kernel. The Indians collect large quantities of them for food. When fresh and slightly roasted they are very palatable. There can be little doubt of this being distinct from the Pinus cembroides of Mexico. The leaves of the latter are shorter and constantly in threes, and the cones are three or four times larger, with much more numerous scales.

PINUS PONDEROSA, *Dougl.; Newberry, l. c. p.* 36, *cum ic. xylog.* P. Engelmanni, *Torr. in Bot. Whipp. Rep. p.* 141. P. brachyptera, *Engelm. in Wisliz. Rep. p.* 89. Mountains near the Copper Mines, New Mexico. The leaves in some of the specimens are ten inches long. Dr. Newberry, who had abundant opportunity of studying the forest trees of New Mexico, California, and Oregon, in their native place of growth, has clearly shown (as we think) that P. brachyptera, *Engelm.*, is identical with the earlier published P. ponderosa, *Douglas*, to which species he also refers P. Benthami, *Hartw.*, and P. Beardsleyi, *Murr. in Edinb. New Phil. Jour.* 1855, *p.* 286.

PINUS MURICATA, *D. Don in Linn. Trans.* 17, *p.* 441; *Lindl. in Jour. Hort. Soc. Lond.* 4, *p.* 216, *cum ic. xylog.* P. Edgariana, *Hartw. l. c.* 3, *p.* 217. (TABLE LIV.) Near Monterey, California; *Parry* A small tree, seldom more than 15 or 20 feet high. Leaves of a deep vivid green. Our cones (which are, perhaps, not quite mature) are smaller than the one figured in the Hort. Trans. l. c.

PINUS CHIHUAHUANA, *Engelm. in Wisliz. Rep. p.* 103? Hills at the Copper Mines, New Mexico; *Bigelow.* (No. 1888, *Wright.*) Our specimens accord well with Dr. Engelmann's description, except that the apex of the scale, instead of being pointless, is armed with a small recurved prickle; but this is very fragile, and may have been rubbed off in the specimens collected by Wislizenus. The cones (not mature) are conical-ovate, rather pointed, about 2 inches long, and an inch and a quarter near the base. The leaves are remarkably slender.

PINUS INSIGNIS, *Dougl. in Loud. Arboret.* 4, *p.* 2265, fig. 2170–2172; *Torr. in Whipp. Rep. p.* 141. P. tuberculata and P. radiata, *D. Don.*—(Tab. LV.)—Near Monterey, California; *Parry.* Hartweg remarks (*Hort. Jour.* 2, *p.* 123) that in close woods, a mile or two from the shore, the leaves and cones are much larger than when the tree grows near the beach. Cones usually 3 or 4 together, and pendulous. They are almost always imperfect on one side, and thus are more or less gibbous.

PINUS DEFLEXA (n. sp.): foliis ternis longissimis(7–8-unc.) tenuibus, vaginis brevibus; strobilis ovatis acutis; squamarum apophysi compresso-pyramidata deflexa, umbone lato-uncinato recurvo; seminibus ala duplo brevioribus. (Tab. LVI.) Summit of the Cordilleras of California; *Parry.* "A handsome tree, with an even columnar trunk." This species is closely allied to P. rigida

of the Atlantic States, but is sufficiently distinct. I have not been able to refer it to any Californian or Mexican pine hitherto described.

PINUS SABINIANA, *Dougl.; Lamb. Pin.* (*ed.* 2) 2, *p.* 146, *t.* 80; *Endl. Syn. Conif. p.* 159. (Tab. LVII.) Mountains east of San Diego, California; *Parry*. One of the largest of the California pines, being often from 60 to 100 feet high, and the trunk 2 to 4 feet in diameter. It is remarkable for its spreading branches, and for its large heavy cones with strong hooked scales. The nuts are large and edible. Immense quantities of them are collected by the California and Oregon Indians, who depend upon them for a large portion of their winter food.

PINUS TORREYANA (*Parry MSS.*): foliis quinis elongatis (6–9-unc) rigidis, vaginis squamosis (5–10-lin.) strobilis subglobosis, squamarum apophysi elongato-pyramidata deflexa, umbone continuo obtuso subrecurvo. (TAB. LVIII and LIX.) Bluffs near the mouth of Solidad creek, 10 miles north of San Diego, California; *Parry*. A small tree, seldom more than 20 or 30 feet high, with a trunk 12 to 15 inches in diameter; often almost prostrate from its being exposed to strong ocean gales. Bark of the young branches whitish; the lower part of the trunk scaly. Branches horizontal, but curved upward towards the extremity. Leaves stouter than in any other North American pine, rough on the margin, abruptly pointed, the sheaths nearly two lines in diameter and an inch and a half long in the young leaves. Cones conical-globose, about 4½ inches long. Seeds, without the wing, three-fourths of an inch long, with a thick bony shell. This is the only pine of the section Pseudo-strobus found within the limits of our flora. P. Apulcensis which resembles it, differs in its more slender and shorter leaves, and ovate smaller cones, &c. It is also allied to P. Orizabæ, *Gordon in Lond. Hort. Jour.* 1, *p.* 237 *cum icon.*, but that has very slender leaves, which are extremely rough on the angle, and ovate cones.

PINUS LAMBERTIANA, *Dougl. in Linn. Trans.* 15, *p.* 50; *Lamb. Pin.* (*ed.* 2) 1, *p.* 57, *t.* 34; *Newberry, l. c. p.* 42, *fig.* 14. On the mountains east of San Diego, California; *Parry*.

ABIES DOUGLASII, *Lindl.; Nutt. Sylv.* 3, *p.* 136, *t.* 117; *Hook. Fl. Bor.-Amer.* 2, *p.* 162, *t.* 115; *Newberry, l. c. p.* 54. *fig.* 20 *& t.* 8. Mountains east of San Diego, California; *Parry*. Mountains of western Texas and New Mexico; *Bigelow*. A noble tree, 50–100 feet high. In Oregon it sometimes attains the height of 300 feet.

TAXODIUM DISTICHUM, *Rich. Conif. p.* 52, *t.* 10. Cupressus disticha, *Linn.; Michx. f. Sylv.* 2, *p.* 329, *t.* 151. Valley of the Rio Grande below the mouth of Los Moros, in western Texas, Cohahuila, and Neuvo Leon. (No. 2213, *Berlandier.*) Below the Salado this noble tree is often seen in the river itself, sometimes where the water is 16 feet deep and the current strong; *Schott*. Dr. Bigelow found it at Santa Rosa, Cohahuila, flowering in January.

SEQUOIA SEMPERVIRENS, *Endl. Conif. p.* 198; *Newberry, l. c. p.* 57, *fig.* 23. Taxodium sempervirens, *Lamb. Pin.* (*ed.* 2) 2, *t.* 64. Woods in the Coast Range of mountains east of Monterey, south of which it is very rare. This is the celebrated *redwood* of California; the most valuable timber tree of that State.

JUNIPERUS TETRAGONA, *Schlecht.* var. OSTEOSPERMA, *Torr. in Whippl. Rep. p.* 141. Dry rocky places, San Felipe, &c., California; *Parry*. A much branched shrub of regular conical form, 6–13 feet high.

JUNIPERUS PACHYPHLÆA, *Torr. l. c.* Hill sides, western Texas, New Mexico, Chihuahua, and Sonora. The fruit varies from 3 to 5 lines in diameter, and is sometimes only two-seeded. When unusually large it sometimes contains 4 and even 5 seeds.

JUNIPERUS OCCIDENTALIS, *Hook. Fl. Bor.-Amer.* 2, *p.* 166; *Torr. l. c.; Newberry l. c. p.* 59, *t.*

10. J. Andina, *Nutt. Sylv.* 3, *p.* 95, *t.* 110. Rocky places, valley of the Pecos; *Bigelow.* It is also a native of California and Oregon.

JUNIPERUS VIRGINIANA, *Linn.; Michx. Sylv.* 2, *p.* 353, *t.* 156. Rocky hills, western Texas; *Bigelow.*

LIBOCEDRUS DECURRENS, *Torr. in Smithson. Contrib.* 6, *p.* 7, *t.* 3, *& in Whippl. Rep. p.* 140. Summit of the mountains east of San Diego, California; *Dr Parry.* A noble tree; sometimes 150 feet high. The wood resembles that of the white cedar.

THUJA GIGANTEA, *Nutt. in Jour. Acad. Phil.* 7, *p.* 52; *& Sylva.* 3, *p.* 102 *t.* 111; *Newberry, l. c. p.* 57, *fig.* 22. Near San Diego and other parts of California; *Parry.* This is the *Arbor vitæ* of California and Oregon. It occurs as far north as Nutka Sound.

CUPRESSUS MACROCARPA, *Hartw. in Jour. Hort. Soc. Lond.* 2, *p.* 187, *& 4, p.* 296, *cum icon. xylogr.* C. Macnabiana, *Murray in Edinb. New Phil. Jour., April,* 1855? Near the seashore at Monterey, California; *Parry.* A tree often 30 feet or more in height, with a trunk 18 inches in diameter. Hartweg states that he has seen it 60 feet high, with a trunk of 3 feet in diameter. The head is usually depressed and very dense. Branchlets distinctly quadrangular, rigid, and stouter than in J. Virginiana. Leaves closely imbricated, rhombic-ovate, obtuse, very thick, depressed each side of the blunt keel. Sterile aments globose-ovate, 1½ line long. Anthers 4-celled. Fruit the size of a large nutmeg, globose. Scales 6, thick and woody, irregularly 4 to 5-angled, each with a strong excentric protuberance or blunt point. They are closely joined at first, but at length separate from one another. Seeds 6 to 8 under each scale, angular by compression, narrowly winged.

CUPRESSUS GOVENIANA, *Gordon in Jour. Hort. Soc. Lond. l. c. p.* 295, *cum icon. xylogr.* On the mountains east of San Diego, California; *Parry.* A shrub 6 to 10 feet high, slender, and moderately branched. Leaves as in C. macrocarpa, except that they are less appressed. Sterile aments numerous, oblong. Fruit 4 to 6 lines in diameter; scales 10, mucronate in the depressed centre. Dr. Parry thinks he has seen forms intermediate between this and the last species, but none such were among his specimens.

LEMNACEÆ.

LEMNA TRISULCA, *Linn.; Kunth, Enum.* 3, *p.* 5; *Torr. Fl. N. York,* 2, *p.* 246. On the San Felipe creek below the mouth of the Pecos; *Bigelow, Schott.* On the Mimbres, New Mexico; *Thurber.* (No. 1890, *Wright.*)

LEMNA MINOR, *Linn.; Kunth, l. c.; Torr. l. c.* In running water, San Luis Rey, California, associated with Azolla; *Parry.* Cimieluque Springs, Chihuahua; *Bigelow.* (No. 1892, *Wright.*) The specimens are without flowers or fruit, so that we are not certain of the species.

LEMNA POLYRRHIZA, *Linn.; Kunth, l. c.; Torr. l. c.* On the surface of water, borders of the Limpia and other streams, Texas; *Bigelow.* Cimieluque Springs, Chihuahua; *Wright.*

TYPHACEÆ.

TYPHA LATIFOLIA, *Linn.; Kunth, Enum.* 3, *p.* 90; *Torr. Fl.* 2, *p.* 247. In water, Painted Caves, western Texas; *Bigelow.*

NAIADACEÆ.

NAIAS FLEXILIS, *Rostk.; Kunth, Enum.* 3, *p.* 114. N. Canadensis, *Michx. Fl.* 2, *p.* 220; *Torr. Fl. N. York,* 2, *p.* 250. Western Texas; *Bigelow, Wright.*

ZANNICHELLIA PALUSTRIS, *Linn.; Kunth, Enum.* 3, *p.* 124; *Torr. l. c. p.* 253. Slow-flowing streams and stagnant waters, western Texas, Chihuahua, and Sonora.

POTAMOGETON PECTINATUS, *Linn.; Torr. Fl. New York*, 2, *p.* 247. P. marinum, *Linn.*; *Michx. Fl.* 1, *p.* 102. Flowing water near San Diego, California; *Parry.* Tucson, Sonora; *Schott.* (No. 1895, *Wright.*)

POTAMOGETON HYBRIDUS, *Michx. Fl.* 1, *p.* 101; *Torr. l. c.* In water on the prairies of the Guadalupe river, Texas, May; *Wright.*

POTAMOGETON PAUCIFLORUS, *Pursh, Fl.* 1, *p.* 121; *Torr. l. c.* P. gramineus, *Michx. Fl., p.* 102, non *Linn.* Stagnant water of the Limpio, July; *Bigelow.*

POTAMOGETON LUCENS, *Linn.; Kunth, Enum.* 3, *p.* 132; *Torr. l. c. p,* 255. San Antonio, Texas, to the Rio Grande.

POTAMOGETON NUTANS, *Linn.; Kunth, Enum.* 3, *p.* 127; *Torr. l. c. p.* 253. Waters of the Limpio, Texas; *Bigelow.* Ojo Caliente, Chihuahua; *Thurber.* Los Noyales, Sonora; *Capt. E. K. Smith.*

ALISMACEÆ, by Dr. George Engelmann.

SAGITTARIA SIMPLEX, *Pursh, Fl.* 2, *p.* 397; *Gray, Man. ed.* 2, *p.* 439. In ponds, western Texas; *Wright.*

SAGITTARIA CALYCINA (Engelm. MSS): pedicellis fertilibus sterilia æquantibus; fructiferis recurvatis; floribus omnibus hermaphroditis, fertilibus subdodecandris, sterilibus polyandris ovaria pauca sterilia gerentibus; filamentis subulatis læviusculis seu tenuiter papillosis antheram late ovatam subæquantibus seu paullo superantibus; stylo erecto ovario longiore in carpellis maturis obovatis duplo longioribus horizontali; sepalis orbiculatis carpellorum capitatum arcte involventibus.

Var. *a.* MAXIMA: foliis maximis sinu latissimo hastatis, lobis divaricatissimis tenuiter subulato-appendiculatis; scapo robusto ramoso; bracteolis lanceolatis acutis; verticillis fructiferis pluribus capitulis magnis.—On the Red river, Louisiana; *Dr. Hale.*

Var. *β.* MEDIA: foliis minoribus sinu latissimo hastatis lobis divaricatis s. divaricatissimis acuminatis; scapo debili simplici verticillo infimo solum (raro duobus) fructifero; bracteis ovatis obtusis; capitulis minoribus.—Saline swamps, Jefferson county, Missouri; *Engelmann.*

Var. *γ.* FLUITANS: foliis oblongo-linearibus fluitantibus; scapo debili verticillis sæpe 1–2-floris; bracteis obtusis; pedicellis elongatis inequalibus; capitulis minoribus.—Ponds and slow-flowing waters, western Texas. *Wright*, No. 1899. Also in Missouri, and in the Merrimac river, Massachusetts; *Engelmann.*

[Dr. Bigelow collected near San Elcearío, on the Rio Grande, a Sagittaria which was overlooked when Dr. Engelmann revised the genus in my herbarium in 1856. It seems to be the same as a plant from western Texas, which Dr. E. named, provisionally, *S. longiloba*, and which he regarded as very near S. simplex. We can find no sufficient characters for distinguishing it from that species. The leaves, however, are sagittate, with very long, narrow, and widely diverging lobes, a state in which we have never seen S. simplex. J. T.]

ORCHIDACEÆ.

PLATANTHERA LEUCOSTACHYS, *Lindl. Gen. & Spec. Orch. p.* 288; *Hook. Fl. Bor.-Amer.* 2, *p.* 198. Santa Cruz, Sonora; *Thurber.* Near Montery, California, June. (No. 1900, *Wright*, a slender variety.) We have what we regard as the same species, from Mokelumne and Monterey, California, collected by Mr. Rich, and from Observatory Inlet, British America. Mr. Rich's specimens show a transition from the stouter form, with a dense inflorescence, to the slender variety, with more scattered flowers, of the plant collected by Dr. Parry.

PLATANTHERA DILATATA, *Lindl. p.* 287; *Torr. Fl. N. York*, 2, *p.* 267. Mountains east of San Diego, California, May; *Parry.*

EPIPACTIS GIGANTEA, *Dougl. in Hook. Fl. Bor.-Amer.* 2, *p.* 202, *t.* 202. Moist ravines near the mouth of the Pecos; *Bigelow.* (No. 1901, *Wright.*) The leaves in Mr. Wright's specimens are narrower than in the Californian plant, but in Dr. Bigelow's they are quite as broad.

BLETIA APHYLLA, *Nutt. Gen.* 2, *p.* 194. Western Texas; *Wright.* Sepals deep brownish purple. Petals dull brownish yellow; the 3-lobed lip with 5 broad plaits or folds, purplish.

AMARYLLIDACEÆ.

HABRANTHUS ANDERSONI, *Herb. in Lindl. Bot. Reg. t.* 1345: Var. TEXANUS, *Bot. Mag. t.* 3596. Western Texas, from San Antonio to the Rio Grande, October. The peduncles are often 6 inches long. (No. 1904, *Wright.*)

COOPERIA PEDUNCULATA, *Herb. Amaryll. p.* 179, *t.* 42, *f.* 3–5, *& in Bot. Mag. t.* 3739. Prairies, Texas, from the Blanco river to the Rio Grande; also in Nuevo Leon, March—October. (No. 1902, *Wright.*)

COOPERIA DRUMMONDI, *Herb. in Bot. Reg. t.* 1835. On hills San Antonio, Texas, to the Rio Grande, August—October. (No. 1902, *Wright.*)

AGAVE AMERICANA, *Linn. Sp. p.* 461; *Kunth, Enum.* 5, *p.* 819. Western Texas, bordering the Rio Grande, and in the Mexican States, west; also on the Gila. (No. 1906, *Wright?*) This is one of the species called *Maguey* by the Mexicans. It is an exceedingly useful plant, as will be seen from Mr. Schott's notes. In many parts of Mexico, where it is now very common, it has doubtless been introduced.

AGAVE AMERICANA, *β*? LATIFOLIA: foliis ovatis acuminatis; floribus minoribus. Hills near the Copper Mines of New Mexico; *Emory;* and near Rock Creek; *Bigelow.* The leaves are more than a foot long and 4 or 5 inches wide, forming a cone which is from 2½ to 3 feet in diameter; the margin armed with short spreading or reversed prickles. From the centre rises a flower stalk to the height of 10 feet. Only the withered and somewhat persistent flowers were collected. These are scarcely one-third as large as those of the narrower leaved plant. The capsule is smooth, oblong, an inch and a half long, and three-fourths of an inch in diameter. We are yet in doubt as to whether this is a distinct species from A. Americana. Both are called *Maguey* in some parts of New Mexico and on the Gila, but sometimes the latter only is so named, and the other Mescal.

AGAVE LECHEGUILLA (n. sp.?): foliis anguste lanceolatis crassis patulis margine remote aculeatis; spica longissima; floribus subsessilibus sæpissime per paria approximatis; perianthii segmentis (uncialibus) erectis.—Mountains near El Paso, and along the Rio Grande downward; common, growing in patches, May—June. (No. 682 and 1907, *Wright.*) Caudex 4–6 inches

high. Leaves 12–15 inches long and 1–1½ inch wide, thick, rounded underneath and somewhat channelled above, terminating in a stout spine, the margin armed with short strong hooked prickles, which are usually reversed. Scape 6–10 feet long, the upper part pretty thickly covered with flowers, which are mostly in pairs (the lowest in threes) and arise from very short (1–2 lines) forked peduncles or branches. Bracts lanceolate from a broad clasping base, 2 lines long, deciduous. The perianth above the ovary is about an inch long, white with a tinge of yellow, and the segments are narrowly-oblong. Stamens and style much exserted. Stigma clavate, obtuse, obscurely 3-lobed. Capsule about an inch long and half an inch in diameter, erect, obtusely triangular, with a short abrupt acumination. Seeds in a double series, semiorbicular, compressed vertically, black and shining. We cannot identify this species among those described by *Kunth* and later writers. The fibres of the leaves are used for making coarse ropes, bagging, etc.

AGAVE GEMINIFLORA, *Gawl. in Brand's Jour. Sc.* 1, *t.* 1? var. SONORÆ: foliis angusto-linearibus elongatis crebris superne concavis, subtus rotundatis, apice terretibus convolutis in spinam terminalem excurrentibus, margine filamentosis; spica longissima, floribus per paria approximatis; perigoniis (uncialibus) tubuloso-infundibuliformibus.—Sierra del Pajarito, Sonora, August; *Schott.* Leaves all radical, 6–12 inches long and 3–4 lines wide; the margin splitting off into very fine white threads and entirely destitute of spines or serratures. Scape (including its spike) 5–6 feet high. The flowers in pairs on very short erect stalks. The perianth above the ovary is about an inch long, with a somewhat funnel-form tube, and narrowly oblong segments, which are at first a little spreading, but afterwards erect. Stamens and style exserted and the linear anthers, as usual, very large for the size of the flower.

AGAVE PARVIFLORA (n. sp.): acaulis; foliis lineari-lanceolatis basi valde dilatatis infra medium margine catilagineo-denticulatis, ultra medium filamentosis; spica elongata; pedunculis brevissimis dissitis 2–4-floris; perianthiis (vix semiuncialibus) subcampanulatis, laciniis breviovatis; capsulis subglobosis.—On various sierras of Pimeria Alta, Sonora; *Schott.* Leaves all in a radical cluster, 2½–3 inches long and about half an inch wide, thick, much dilated at the base; the margin below the middle furnished with minute but evident cartilaginous teeth, while on the upper half the margin bears rather stout white threads; the spiny tip is not more than 2–3 lines long. Scape 4–5 feet long; the clusters of flowers more scattered than in the last species. Only the withered persistent flowers were collected. These when soaked were scarcely half an inch long and whitish with a tinge of rose-color. Stamens and style exserted. Capsule 4–5 lines long and of nearly the same diameter. Seeds as in the last species. This is possibly A. filifera, *Salm-Dyck*, a species of which the flowers and fruit are not described.

AGAVE VIRGINICA, *Linn.; Michx. Fl.* 1, *p.* 187; *Kunth, Enum.* 5, *p.* 833. Hills on the Rio Grande from El Paso down to Laredo, April—August. (No. 683 and 1905, *Wright.*)

I subjoin a description, by Dr. Engelmann, of a species of Agave found at Eagle Pass on the Rio Grande, (probably collected by Mr. Schott,) of which there are no specimens in the collections:

AGAVE MACULATA (Engelm.): radice crassa cylindrica nigra; foliis radicalibus lanceolato-linearibus longe acuminatis subtus convexis supra profunde concavis recurvatis glaucis maculis atro-virentibus notatis, margine albido cartilagineo-dentatis apice acutis nec spinescentibus; scapo basi foliis paucis instructo; floribus in spicam simplicem dispositis brevissime pedicellatis; tubo corollæ superne vix ampliato, laciniis lineari-oblongis rotato-patentibus.—Eagle Pass on

the Rio Grande. Root 6–8 lines in diameter, 4–6 inches long, black, with long thick white fibres. Leaves 4–6 inches long, ½ an inch wide, deeply channelled, but not carinate, very glaucous, the dark greenish brown blotches more distinct on the upper than the lower surface. Scape 1½–2 feet high. Spike about 6 inches long, with 12–15 flowers. Bracts subulate, longer than the pedicel, which is about one line long and articulated in the middle. The flowers, which are of musky not disagreeable odor, are about 20‴ long; ovary 6‴, tube 9‴, the limb about 6‴. Laciniæ of the perianth at first green, afterwards on both sides (with the filaments) of a dirty purplish color Evidently near A. revoluta, *Klotzsch;* but that species has smooth-margined leaves; limb of the perianth equal to the tube; stamens free in the tube and longer than the limb. To Polyanthes Mexicana, Zucc. (which Kunth in Enum. 5, p. 847, says, is probably a species of Agave) it is still more nearly related, but that has leaves entire on the margin, with reddish dots; flowers white, in pairs and sessile, the tube 18 lines long, segments only 3–4 lines long. Capsule (immature) ovate-oblong obtusely triangular. Nothing is said of the fragrance of the flowers.

BROMELIACEÆ.

TILLANDSIA RECURVATA (*Linn.; Le Conte in Ann. Lyc. N. York*, 2, *p.* 132): cæspitosa; foliis subdistichis filiformibus teretibus anguste canaliculatis cinereo-lepidotis recurvatis; pedunculis folio longioribus unifloris glabriusculis; bracteis 2–3 acuminatis calyce longioribus.—On trees, near the Rio Coleto, Texas; *Thurber*. On oaks and grape vines, Los Moros; *Bigelow*. Lower Rio Grande; *Schott*. San Fernando, Mexico; *Berlandier*, No. 818. The specimens are all in fruit, and the peduncles mostly one-flowered.

TILLANDSIA USNEOIDES, *Linn.; Ell. Sk.* 1, *p.* 379; *Le Conte, l. c.* On trees, western Texas, not found on the Rio Grande above the mouth of the Pecos.

DASYLIRION TENUIFOLIUM (n. sp.): caudice brevissimo; foliis linearibus gramineis planis vix rigidulis nitidis margine spinuloso-scaberrimis; panicula elongata, ramis simplicibus distantibus sublaxifloris, basi subnudis; pedicellis flore sublongioribus; fructibus membranaceis, lobis carinatis vix alatis; seminibus oblongo-obovatis. Among rocks, borders of the Sabinal river; *Wright*, (No. 1919.) Stony places on the high plateau of the upper Guadalupe, Texas; *Lindheimer*. Caudex short and almost subterranean. Radical leaves about a foot long, 2–2½ lines wide, bright green and shining on both sides, much thinner in texture than in any other species of this genus, those of the scape gradually smaller. Stem or scape (including the panicle) about 3 feet high. Branches of the panicle 2–3 inches long. Flowers solitary or somewhat fasciculate. Perianth scarcely a line and a half in diameter. Ovary 3-celled, with 2 erect ovules in each cell; stigmas 3, oblong, sessile. Fruit rather broader than long, 3-lobed, one or two of the seeds commonly abortive. Seed minutely reticulate-rugose. Remarkable for the thin leaves and long naked panicle.

DASYLIRION GRAMINIFOLIUM, *Zucc. Pl. Nov. v. Min. Cog. fasc.* 4, *p.* 225, *t.* 1. Hill sides and table land, western Texas, New Mexico, Chihuahua, and Sonora, westward to the Colorado. Neuvo Leon; *Berlandier*, (No. 3211. No. 694, *Wright*. No. 70, 212, 212, 419, and 549, *Fendler*.) Caudex 3–5 feet high, the upper part clothed with the long spiny-serrated recurved leaves. Scape 6–8 feet high. Flowers in a long dense panicle of close spikes, which are subtended by broadly lanceolate clasping foliaceous spathes. The male flowers with a sterile ovary, and the female with sterile anthers. Bracts and bracteoles broadly ovate, acuminate

serrate-lacerate, scarious. Perianth white; the segments obovate, concave. Ovary ovate, obtusely triangular, one-celled, with 6 anatropous erect ovules at the base of the cavity. Fruit coriaceous, narrowly winged, indehiscent. Seed 3-sided, with obtuse angles, smooth. Embryo cylindrical, in the axis of horny albumen, which it nearly equals in length. D. Texanum *Scheele*, seems to be hardly distinct from this species.

DASYLIRION BIGELOVII, *Torr. Bot. Whipp. Rep. p.* 151. Sierra del Tule y Tinaja Alta, Sonora; *Schott.* "Stem 6 feet high, and 2–3 feet in diameter." Leaves 3–5 feet long, and nearly an inch in diameter about the middle, flat; the margin a little rough, and sometimes separating into threads. "Scape 6–8 feet long. Raceme 1–1½ foot long, and nearly a foot in diameter at the base." Fruit papyraceous, 1 or 2 of the cells usually sterile, not opening by regular dehiscence, but by the rupture of the thin walls. Seeds oblong-obovate, whitish, dull, slightly reticulated. Embryo slender, cylindrical, in the axis of horny albumen.

DASYLIRION LINDHEIMERIANUM, *Scheele in Linnæa*, 25, *p.* 362. High plains and hill sides near the Copper Mines, New Mexico; *Bigelow.* El Podrero, Sonora; *Schott.* (No. 623, *Wright*, No. 213, 297, 551, 552, *Lindheimer.*)—All our specimens are in fruit. Leaves a yard long, and about 3 lines wide towards the base, channelled above, rounded underneath. Pedicels filiform, thickened and triangular at the base of the flower. Fruit membranaceous, nearly twice as broad as long, and exceeding the pedicels in length, conspicuously 3-winged, only one of the cells usually fertile, and this containing but a single obovate seed.—This species seems to be very like D. Hartwegianum, *Kunth.* D. Bigelovii, which it also resembles, differs in its much larger fruit, broader leaves, and short pedicels.

DASYLIRION ERUMPENS (n. sp.): foliis lineari-ensiformibus e basi non attenuatis superne angusto-filiformibus supra canaliculatis infra semiteretibus margine serrulato-scabris; spathis e basi lata longissime angustissimeque attenuatis; pedicellis vix flore æqualibus; fructibus trilobis trilocularibus lobis carinatis vix alatis; seminibus globosis. Hills and gravelly places, western Texas and New Mexico, June. (No. 1918, *Wright.*) Leaves 2½–3 feet long, about 3 lines wide toward the base, tapering to a long, almost filiform extremity, rigid; the margin rough, with minute cartilaginous serratures. Panicle compound; the spathaceous bract at the base of each primary branch dilated and clasping below, then tapering to a long filiform point. Pedicels jointed near the middle. Flowers white, about 2 lines long, the male (as usual) bearing imperfect anthers, and the female an infertile ovary. Capsule with one or two of the cells often without seeds, the angles prominent and acute, but not winged. Seeds when near maturity, bursting the pod, and then remaining for some time attached to the placenta.

IRIDACEÆ.

IRIS MACROSIPHON, *Torr. Bot. Whip. Rep. p.* 144. Near San Francisco, and in Napa county, California, March; *Thurber.*

SISYRINCHIUM BERMUDIANA, *Linn.*; var. MUCRONATUM. San Diego, California, May; *Thurber.* Western Texas; common along the Rio Grande; also in New Mexico, near the Copper Mines. S. minus, *Engelm. & Gray*, (*Pl. Lindh.*, No. 313,) can hardly be considered a distinct species from this, as intermediate forms not unfrequently occur.

NEMASTYLIS ACUTA, *Engelm. & Gray, Pl. Lindh.* 1, *p.* 27 (*adnot.*) N. geminiflora, *Nutt. in Trans. Amer. Phil. Soc.* (*n. ser.*) 5, *p.* 157. Ixia acuta, *Bart. Fl. N. Am.* 1, *t.* 76. Western Texas, *Thurber.* Mountains of Muerte; *Bigelow.*

TRIFURCIA CÆRULEA, *Herb. in Bot. Mag. sub t.* 3779. Prairies of the Colorado, Texas; *Wright.*

SMILACEÆ.

SMILAX TAMNOIDES, *Linn. sp. p.* 1460. Piedra Pinta, western Texas (in fruit); *Bigelow.* An extremely variable species, of which S. Bona nox, S. hastata and S. pandurata are doubtless mere varieties. My friend, Dr. Chapman, who has carefully studied, in a living state, the Florida species of this genus, thinks that S. Beyrichii, S. Sprengelii and S. hederæfolia of Kunth are also forms of S. tamnoides.

TRILLIUM SESSILE, *Linn. Spec. p.* 284, var. ANGUSTIPETALUM, *Torr. Bot. Whippl. Rep. p.* 151. Moist places near Monterey and San Luis Obispo, California, March—April; *Parry.* Napa county, in the same State; *Thurber.*

LILIACEÆ.

FRITILLARIA LANCEOLATA, *Pursh, Fl.* 1, *p.* 230. F. mutica, *Lindl. Bot. Reg. fol.* 1663? (TAB. LXI.) In pine woods near Monterey, California, February—April; *Parry;* also in Napa county; *Thurber.* The leaves of Dr. Parry's specimens are unusually narrow.

FRITILLARIA KAMTSCHATCENSIS, *Fisch. in Hook. Fl. Bor.-Am.* 2, *p.* 181, *t.* 193, *A.* San Lusi Rey and San Luis Obispo, California; *Parry.*

CALOCHORTUS UNIFLORUS, *Hook. & Arn. Bot. Beech. p.* 398, *t.* 94. Monterey, California, May; *Parry.*

CALOCHORTUS VENUSTUS, *Benth. in Hort. Trans.* (*n. ser.*) 1, *p.* 411, *t.* 15, *f.* 3. Monterey, California, May; *Parry.* Near the Copper Mines, New Mexico, May—June; *Bigelow.* San Luis mountains, Sonora; *Capt. E. K. Smith.*

CALOCHORTUS LUTEUS, *Dougl.; Lindl. Bot. Reg. t.* 1661. San Diego, California, May; *Parry.*

CALOCHORTUS SPLENDENS, *Benth. l. c. p.* 411, *t.* 15, *f.* 1. San Diego, California, May—June; *Parry, Thurber.*

CYCLOBOTHRA ALBA, *Benth. l. c. p.* 413, *t.* 14, *f.* 3. Monterey, California, May; *Parry.*

ALLIUM CERNUUM, *Roth; Bot. Mag. t.* 1134; *Kunth, Enum.* 4, *p.* 435. Hills near the Copper Mines, New Mexico, July; *Bigelow.* (No. 1913, *Wright.* No. 848. *Fendler.*)

ALLIUM RETICULATUM, *Nutt. in Fraser, Cat.; Hook. Fl. Bor.-Am.* 2, *p.* 184, *t.* 195; *Kunth, l. c.* Hill sides and prairies. Western Texas to the Rio Grande and Chihuahua; also in New Mexico west to the Copper Mines, April. (No. 1915 and 1916, *Wright.*)

ALLIUM MUTABILE, *Michx. Fl.* 1, *p.* 195; *Kunth, Enum.* 4, *p.* 451. Gravelly hills, western Texas; *Wright.* Presidio del Norte on the Rio Grande, and in other places on that river; *Bigelow.* Chihuahua; *Thurber.* The bulb is commonly single, ovate, and 1–1½ inch long. Leaves narrowly linear, shorter than the scape, which is about a foot long. Umbel 15–40-flowered.. Spathe 2–3-valved. Perianth rose color, sometimes very pale; the segments ovate-lanceolate, acute. Stamens about two thirds the length of the perianth; filaments subulate, gradually and moderately dilated downward; anthers oblong. Cells of the ovary 2-ovulate. Capsule subglobose, 3-lobed; the cells rounded at the summit, usually perfecting but a single ovate black seed.

ALLIUM ACUMINATUM, *Hook. Fl. Bor.-Am.* 2, *p.* 185, *t.* 196. San Diego, near the boundary line; *Parry.* New Almaden, California; *Thurber.*

ALLIUM (HESPEROSCORDIUM) MARITIMUM, *Torr. Bot. Whippl. Rep. p.* 149; *Benth. Pl. Hartw. p.* 339. Sandy places near Monterey, California, March; *Parry.*

ALLIUM (NOTHOSCORDIUM) STRIATUM, *Jacq.; Bot. Mag. t.* 1035; *Ell. Sk.* 1, *p.* 385. Prairies of western Texas and along the Rio Grande; common; flowering from March to September. Janos, Coralitas river, Sonora; *Capt. E. K. Smith.*

Sub-genus CHRYSOSCORDIUM. Sepala basi vix connata, erecto-patentia, uninervia. Filamenta filiformia, basi utrinque unidentata. Ovarium sessile: ovula in loculis 4–5. Herba Californica scapigera, bulbosa?; foliis linearibus; floribus umbellatis aurantiacis.

ALLIUM (CH.) CROCEUM (n. sp.) Summit of the mountains east of San Diego, California; *Parry.* Leaves all radical, about a foot long and 2½ lines wide, glabrous. Scape as long as the leaves, slender, terete, naked. Umbel 9–12-flowered; the pedicels 8–10 lines long, spreading, articulated close to the flower. Spathe of 4–5 lanceolate acuminate valves, which are nearly distinct to the base. Sepals 4–5 lines long, orange-yellow, oblong, rather obtuse, with a ciliolate callosity at the tip. Stamens one fourth shorter than the sepals; filaments filiform, with an oblong adnate tooth on each side at the base. Ovary oblong; style about as long as the sepals, filiform; stigma very small, 3-lobed. Capsule (immature) obovate; seeds compressed. This species resembles a small Calliproa lutea. It differs from most of the genuine species of Allium in its yellow flowers, more numerous ovules, and articulated pedicels.

CAMASSIA FRASERI, *Torr. in Bot. Whippl. Rep. p.* 147. Scilla esculenta, *Ker.* S. Fraseri, *Gray, Man. ed.* 2, *p.* 469. Prairies of western Texas; *Wright.*

BRODIÆA (DICHELOSTEMMA) CAPITATA, *Benth. Pl. Hartw. p.* 339. Dichelostemma congestum, *Torr. Bot. Whippl. Rep. non Kunth.* Near Monterey, California, *Parry;* and Napa valley, in the same State; *Thurber.* Until very recently, I had never seen the true B. congesta; all the numerous specimens of what I have taken for it having 6 perfect stamens. As an early figure of Hookeria pulchella, *Salisb.*, which several botanists have referred to B. congesta, represented the flowers as hexandrous, I supposed that the fertile stamens were commonly 6. I have, however, just examined a Brodiæa from Oregon, which exactly accords with Smith's description of B. congesta. Nevertheless it is possible that the usually abortive stamens are sometimes antheriferous.

Var.? PAUCIFLORA: umbella 2–4-flora; pedicellis valde inæqualibus partim spatha 3–4-valva subduplo longioribus. Near the Copper Mines, New Mexico; *Bigelow.* On the Gila river, March; *Parry.* San Francisco Spring, Sonora, *Capt. E. K. Smith.* This may prove a distinct species; for we have seen no intermediate forms.

BRODIÆA GRANDIFLORA, *Smith, l. c.; Kunth. Enum.* 4, *p.* 471; & var. MACROPODA, *Torr. Bot. Whippl. Rep. p.* 149. San Pasqual, California, May; *Thurber.*

CALLIPROA LUTEA, *Lindl. Bot. Reg. t.* 1590; *Kunth, Enum.* 4, *p.* 476. Dry grassy hill sides, near Monterey, California, May; *Parry.*

CHLOROGALUM POMERIDIANUM, *Kunth, Enum.* 4, *p.* 682. Anthericum pomeridianum, *Gawl. Bot. Reg. t.* 561. (TAB. LX.) Pinasquitos, California, May; *Thurber.*

ANDROSTEPHIUM, Nov. Gen.

Perianthium corollaceum, infundibuliforme, 6-fidum, regulare, persistens; laciniis tubo subæqualibus patulis uninerviis. Stamina 6, omnia fertilia; filamentis superne in tubum brevem cylindraceum connatis, inter et ultra antheras biloculares introrsas dorso medium affixas in coronam 6-foliolatum productis. Ovarium sessile, oblongum, 3-loculare; loculis 12–14-ovulatis:

stylus filiformis, stamina æquans; stigma capitato-trilobum. Capsula late-obovata, truncata, 3-loba, lobis compressis. Semina in loculis 8–14, verticalia, compressa, biseriata, nigra. Herba bulboso-tuberosa. Folia omnia radicalia, linearia, semi-cylindrica. Flores in apice scapi umbellati, pedicellati, violacei, bracteis 3–4 involucrati; pedicellis inarticulatis.

ANDROSTEPHIUM VIOLACEUM.—Hills and prairies on the rivers Blanco and Colorado, Texas, March; *Wright*. We have excellent specimens from Dr. R. Gleason, United States army, collected near Fort Arbuckle; and it occurs in Lindheimer's Texan collection fasc. IV. Leaves 6–8 inches long and 1–2 lines wide, arising from a small coated bulb which surmounts a depressed globose bulb or corm. Scape about as long as the leaves, rather stout, bearing at the summit an umbel of 2–7 flowers, which have a faint sweet odor. Bracts scarious, lanceolate, acuminate, 3-nerved. Pedicels rather shorter than the flower. Perianth nearly an inch long, 6-cleft nearly to the middle, the segments more or less spreading, oblong, obtuse. Stamens 6, the free portion of the filaments united into a tube which arises from the orifice of the perianth is conspicuously exserted, and produced between and beyond the anthers into a crown of 6 oblong emarginate lobes. Anthers linear-oblong, notched at each end. Style about as long as the stamens. Ovary entirely free from the base of the perianth. Capsule sessile, with 3 very prominent laterally compressed lobes or cells, which open loculicidally. Seed suborbicular, laterally much compressed nd narrowly winged, vertically imbricated in a double series. Embryo slender, cylindrical, a little curved in the axis of fleshy albumen. The Mexican genus Bessera most resembles this, but it differs in the very short tube of the perianth, in the tube of filaments having only a short tooth between the filaments, and in the form of the capsule.

MILLA BIFLORA, *Cav. Ic.* 2, *p.* 76, *t.* 196, *ex Kunth, Enum.* 4, *p.* 478. M. cærulea, *Scheele in Linnæa*, 25, *p.* 260. On the Rio San Pedro, Sonora; *Schott, Thurber.* No. 1913, *Wright.* Scape 1–3-flowered. Bulb subglobose, clothed with light brown scales. Our plant wholly resembles Mexican specimens collected by Dr. Halsted and others.

ECHEANDIA TERNIFLORA, *Ortega; Kunth, Enum.* 4, *p.* 627. Var.? ANGUSTIFOLIA: foliis 2–4 lin. latis, pedicellis infra medium articulatis; ovarii loculis sub-16-ovulatis. Copper Mines, New Mexico; rocky places near the mouth of the Pecos, and near Rock Creek, July—August; *Bigelow;* (No. 69 and 1912, *Wright.*) Cretaceous hills and ravines near the Pecos; *Schott.* Monterey, Mexico; *Dr. Edwards.* New Mexico, *Fendler*, No. 851. Root a fascicle of thick fleshy fibres. Leaves usually less than 3 lines wide. Stem scapiform, 1½–3 feet long, very slender, often nearly simple above, but more commonly somewhat paniculately branched, the branches erect. Flowers 2–4 or more together in fascicles; the terminal ones racemose and mostly solitary. Pedicels jointed about one-third their length from the base. The expanded perianth about three-fourths of an inch in diameter, orange-yellow; segments narrowly oblong, with closely approximated nerves along the middle. Stamens scarcely half the length of the perianth; filaments roughened with short, obtuse, somewhat retorse teeth; anthers linear-oblong. Ovary obovate, the cells with about 16 anatropous ovules in a double series; style one-third longer than the stamens, filiform; stigma minutely 3-lobed, ciliolate-papillose. Capsule oblong-obovate, obtuse, 3-lobed, thin. Seeds angular, black. E. terniflora differs from our plant in the leaves being 6–7 lines wide, the pedicels jointed in the middle and the more numerous ovules (23–24 in each cell of the ovary.)

SCHŒNOLIRION, Nov. Gen.

Perianthium corollaceum, 6-phyllum, persistens; sepala 3–5-nervia, patentia. Stamina 6, imæ basi sepalorum inserta; filamenta subulata basi complanata; antheræ oblongæ, utrinque bifidæ, introrsae. Ovarium liberum, ovali-globosum, subsessile, 3-loculare; ovula in loculis 2, collateralia, horizontalia, anatropa; stylus filiformis, rectus; stigma minutum, 3-lobum. Capsula globoso-obovata, 3-loba; loculis 1–2-spermis. Semina subglobosa nigra nitida.—Herbæ perennes; rhizomate bulboso-tuberosa; foliis subradicalibus angusto-linearibus subcanaliculatis; scapo gracili; floribus albis in racemis simplicibus vel laxe paniculatis; pedicellis juxta florem articulatis basi bracteatis.

SCHŒNOLIRION MICHAUXII: pedicellis bracteis 2–4-plo longioribus; sepalis ovatis, nervis subdistantibus.—Phalangium croceum, *Michx. Fl.* 1, p. 196. Ornithogalum? croceum, *Ell. Sk.* 1, *p.* 397; *Kunth, Enum.* 4, *p.* 371. O. Texanum, *Scheele in Linnæa, p.* 146. Moist places on the Colorado of Texas, March—April; *Wright.* Also found on the Red River of Louisiana, by Dr. Hale, and in East Florida by *Mr. Buckley* and *Dr. Chapman.* Rhizoma oblong or sometimes elongated, about as thick as the little finger, crowned with a scaly bud or bulb. Leaves 1–1½ foot long, narrowly linear, glabrous, somewhat channelled above, and rounded underneath. Scape 1½–3 feet high, terete, slender, simple, or with a few branches above. Racemes 8–25-flowered, the pedicels 5–8-lines long, somewhat spreading, with short bracts at the base. Perianth, when expanded, 4–5 lines in diameter, spreading, white, the 3 exterior sepals greenish externally along the middle. Stamens a little shorter than the perianth; filaments white. Capsule coriaceous, somewhat truncate, with 3 rounded lobes; cells 1–2-seeded, one or two of them abortive. Seeds globose-obovate, black and shining. Embryo straight in the axis of fleshy albumen. The flowers of this species are yellowish when dry, a circumstance which doubtless gave rise to the specific name of Michaux, but which had best be superseded, as it may lead to error. S. album, *Durand*, differs in its pedicels being much shorter than the subulate bracts; in the oval sepals which are narrowed towards the base, and in the almost confluent nerves. The perianth is also of much more delicate texture than in S. Michauxii, and dries white. This genus was indicated in Durand's account of a collection of California plants made by Mr. H. Pratten and published in the Journal of the Academy of Philadelphia (n. ser. vol. 2.) It is much more nearly related to Ornithogalum than to Phalangium.

SMILACINA STELLATA, *Desf. in Ann. Mus.* 9, *p.* 51. Near the Copper Mines, New Mexico; *Bigelow.* Moist places near Monterey, California, April; *Parry.* The raceme is looser, and the pedicels considerably longer than in the eastern plants.

SMILACINA RACEMOSA, *Desf. l. c.* Mountains on the Mimbres, April—May; *Bigelow, Thurber.* California; *Parry.* The branches of the panicle are shorter and fewer-flowered, both in the California specimens and in those of New Mexico, than in the plant of the Eastern States.

POLYGONATUM BIFLORUM, *Ell. Sk.* 1, *p.* 393? Copper Mines, New Mexico, June; *Bigelow.* (No. 1917, *Wright.*) Whole plant quite smooth. Stem about a foot and a half high. Leaves narrowly oblong, glaucous underneath. Peduncles 2-flowered. Filaments very slightly rough, inserted below the middle of the tube of the perianth.

YUCCA ANGUSTIFOLIA, *Pursh, Fl.* 1, *p.* 227; *Nutt. Gen.* 1, *p.* 218. Sandy hills and plains, New Mexico, Western Texas and Chihuahua, May—August. (No. 910 and 911, *Wright*; No. 850 of Fendler's New Mexican collection.)

YUCCA? PARVIFLORA (n. sp.): subacaulis; foliis anguste-linearibus canaliculatis rigidis recurvatis margine filamentosis; pedunculis scapiformibus subpaniculatis; bracteis e basi dilatatis promisse acuminatis; pedicellis fasciculatis; sepalis linearibus subconniventibus; stylus filiformibus, stigmate integro truncato. Gravelly hills near the mouth of the Pecos; *Bigelow*. Stony hills west of the Nueces, Texas; *Wright*, (No. 1908). Caudex apparently very short. Leaves 12–18 inches long, 4–5 lines wide, conduplicate when dry, very smooth, acute at the tip, but not pungent; the filaments on the margin 1–2 inches long and about as thick as common sewing-thread. Scape 3–4 feet long, with distant clasping bracts; the upper part racemose and somewhat branching. Pedicels 3–4 together, 6–10 lines long, arising from the axis of a clasping bract, erect, a little thickened upward and articulated close to the flower. Perianth white? the divisions about three-fourths of an inch long, scarcely 2 lines wide, rather obtuse, scarcely united at the base. Stamens 6, shorter than the perianth; anthers oblong; bifid at the base. Ovary oblong, 3-celled; the cells with numerous horizontal ovules; style a little exserted, filiform, triangular and a little enlarged toward the extremity. This differs from all the other species of the genus in its elongated filiform style and narrow sepals. The fruit of Mr. Wright's specimens in Dr. Gray's herbarium is unripe. It is subglobose, and about an inch in diameter. As Mr. Wright likens it to a fig, it is doubtless fleshy.

YUCCA PUBERULA, *Haw. in Phil. Mag. March* 1828, *ex Kunth. Enum.* 4, *p.* 272. Y. brevifolia, *A. Schott, MSS.* Valley of the Santa Cruz river, and Sierra del Pajarito, near the monument, Sonora, June; *Schott*. Stems 6–8 feet high. Leaves mostly in a terminal crown, about a foot long and 5–6 lines wide, concave above, a little rounded underneath, of a thick and firm texture, with a few loose threads on the margin, the apex armed with a spine. The persistent retrorsely imbricated vestiges of former leaves give the stem a very rough appearance. Scape 2–3 feet long, paniculate above, pubescent. Bracts at the base of the branches lanceolate, tapering to a long point. Flowers apparently white. Sepals broadly elliptical 1¼ inch long, rather acute. Fruit about 2½ inches long, and 1¼ in diameter, pointed with the base of the styles. "This is the *Sotol* of the Sonorians, but not of the Texans along the Rio Grande. It bears large fleshy fruits which are edible, and called *Datili*, probably on account of their shape."—*Schott*.

YUCCA RUPICOLA, *Scheele in Linnæa*, 23, *p.* 143. Y. tortifolia, *Lindh. MSS.* Gravelly hills and plains, western Texas, New Mexico, and Chihuahua, April–May. (No. 688, 689, and 1,909, *Wright*. No. 709, Fasc. IV, *Lindheimer*.) Fruit an inch and a half long, dry or nearly so, often remarkably constricted near the middle.

YUCCA BACCATA (n. sp.): foliis lanceolatis planis crebris margine filamentiferis apice convolutis, spina terminali brevi; floribus campanulatis; fructibus racemosis cernuis ovatis baccatis. Parras, Cohahuila; *Thurber*. High table lands between the Rio Grande and the Gila; *Major Emory*. This is the same species that is noticed in the Botany of Whipple's Report as having been found at Hurrah Creek, New Mexico, by Dr. Bigelow. According to Dr. Bigelow it is a low species, with a subterranean caudex. We have no information as to the length of the scape. The flowers appear to form a racemose panicle. They are larger than in any other species of Yucca here noticed; the sepals being 2½–3 inches long, tapering to each end and 6–7 lines wide in the middle. The fruit is the size of a large fig, with a sweet edible pulp. Near Monterey, California, Dr. Parry collected the leaves of a yucca resembling those of this species, except in being smaller. On the plains of western Texas, near the Limpio, and in the vicinity of Presidio del Norte, Dr. Bigelow found a yucca 10–15 feet high, with leaves almost exactly like those of

Y. baccata, but the fruit is longer, though not greater in diameter, and the pulp is thicker. It may, till better known, be regarded as a variety (*macrocarpa*) of that species. We have from Mr. Thurber the leaves and a portion of the fruit of a yucca which he collected near Parras, in Cohahuila, where it covers the table lands. It is a tree sometimes twenty-five feet or more in height, with several spreading branches. The leaves are about 15 inches long, and from an inch to an inch and a half wide, flat, terminating in a spiny point, and the margin filamentous. The fruit is two or three inches long, and has a thin sweet pulp. The seeds are thick and black. A figure of the plant is given in Bartlett's narrative, vol. 2, p. 491. Our specimens are hardly sufficient for determining whether it is a described species. It may not be distinct from the yucca found by Dr. Bigelow. Mr. Schott, in his notes, states that on the upper Rio Grande he saw a yucca, bearing edible fruits, with a stem 18 inches in diameter. The trunks have been used in Mexico as palisades in the construction of stockades. Besides the above species, there are two or three others in the collections, which I have not been able to determine satisfactorily for want of sufficient materials. One is a yucca found by Mr. Schott on rocks near San Pasqual, southern California. It is the same that is doubtfully referred to Y. aloifolia in the Botany of Whipple's Report, (excluding the synon. and No. 1909, *Wright.*) The caudex is 1–2 feet high, and the scape 2–3 feet. The leaves are 18 inches or more in length, channelled on the upper side, rounded or obtusely angular underneath, and slightly serrulate-scabrous on the margin; the apex convolute and spiniferous. The flowers (as represented in a sketch) are in a spreading panicle. Capsule coriaceous, obovate, and somewhat truncate, 3-lobed, an inch and a quarter long and of nearly the same breadth. Seeds semiorbicular, thin and flat. If it prove to be a distinct species it may be called Y. Whipplei. The late Dr. Gregg found between Parras and Cerralbo a yucca between 20 and 30 feet in height; but his specimens are too imperfect for comparison.

MELANTHACEÆ.

ANTICLEA FREMONTI, *Torr. in Bot. Whippl. Report, p.* 144. Fields around San Diego, California; *Parry.*

XEROPHYLLUM TENAX, *Nutt. Gen.* 1, *p.* 235, *Gray, Melanth. in Ann. Lyc. N. York,* 4, *p.* 129. Helonias tenax, *Pursh, Fl.* 1, *p.* 243, *p.* 9. Dry hills near the seacoast, Monterey, California, May; *Parry.*

SCHŒNOCAULON DRUMMONDII, *Gray, in Bot Beech. p.* 388, *adn.* S. TEXANUM, *Scheele in Linnæa,* 25, *p.* 262. Near Yorktown, on the Lower Rio Grande, Texas, April—October; *Schott.* This species was first discovered by Drummond, and is No. 284 of his third Texan collection. It was afterwards found by Dr. Riddell and Mr. Lindheimer. The filaments are dilated *upward* and not downward, as stated by Scheele l. c.

JUNCACEÆ.

JUNCUS BALTICUS, *Willd. in Berl. Mag.* 1809, *p.* 298, *ex Kunth, Enum.* 3, *p.* 316. Sandy moist places, western Texas, New Mexico, Sonora and California, June; (No. 1920 and 1921, *Wright.*)

JUNCUS DEBILIS, *Gray, Manual, ed* 2, *p.* 480. J. polycephalus, var.? depauperatus, *Torr. Fl. N. York.* 2, *p.* 328. Wet places along the Limpio, July; *Bigelow.* Arroyo de los Janos, Sonora; *Schott.* (No. 1925, *Wright.*)

JUNCUS XIPHOIDES, *C. A. Meg. in Reliq. Haenk.* 2, *p.* 143, *ex Kunth, Enum.* 3, *p.* 331. Near Monterey, California, May; *Parry.* Very near J. Menziesii β. Californicus, *Hook. & Arn. Bot. Beech, p.* 402.

JUNCUS ARTICULATUS, *Linn.*; *Gray, l. c.* J. lamprocarpus, *Ehrk.* Near the Copper Mines, New Mexico, June; *Bigelow.* Var. CRASSIFOLIUS: foliis crassis compressis vix articulatis. Sonora; *Schott.* Var. MULTIFLORUS: capitulis paucis 20–30-floris. Fronteras, Sonora; *Thurber.*

JUNCUS NODOSUS, *Linn.*; *Gray, l. c.* Laredo, on the Lower Rio Grande, June; *Schott.* Var. MEGACEPHALUS, *Torr. Fl. N. York*, 2, *p.* 327. San Elceario on the middle Rio Grande; *Bigelow.* Along the Gila, Sonora; *Thurber, Schott.*

JUNCUS TENUIS, *Willd. sp.* 2, *p.* 214; *Torr. Fl. N. York*, 2, *p.* 327. Hills at the Copper Mines, New Mexico; *Thurber.*

JUNCUS MARGINATUS, *Rostk. Junc. p.* 38, *t.* 2, *f.* 3. Western Texas; *Wright.* (No. 1923 in part.

JUNCUS LONGISTYLIS (n. sp.): culmo erecto simplici compresso foliato; foliis planis gramineis; capitulis paucis 4–6-floris in panicula sub-simplici dispositis; sepalis lanceolatis mucronatis capsula obovato-oblongo obtusa mucronata paullo longioribus; seminibus oblongis utrinque acutis ecaudatis. Near the Copper Mines, New Mexico, June; *Bigelow.* (No. 1924, *Wright.*) Culms from a rather stout root-stock, 12–18 inches high, slender, distinctly compressed. Leaves flaccid, 1–1½ line wide, obscurely nerved; the radical ones 6–8 inches long, those of the culm (2–3 in number) shorter. Heads 4–8 in a contracted or oblong panicle, the bracts at the base ovate, scarious, about as long as the sepals. Stamens 6. Style more than half as long as the ovary. Capsule usually about one-fifth shorter than the sepals. A very distinct species. J. marginatus, to which it is nearest related, differs in the usually much more numerous heads, triandrous flowers, short style, obtuse inner sepals and subglobose capsule. No. 857 of Fendler's New Mexican collection seems to be a variety of this species, with only two or three closely approximated heads.

JUNCUS BUFONIUS, *Linn. Sp. p.* 466; *Kunth, Enum.* 3, *p.* 353. Moist places, Sonora and California; *Thurber.*

LUZULA CAMPESTRIS, *DC.; Torr. Bot. Whippl. Rep. p.* 143. Pine woods near Monterey, California, May; *Parry.*

PONTEDERIACEÆ.

HETERANTHERA LIMOSA, *Vahl, Enum.* 2, *p.* 44; *Pursh, Fl.* 1, *p.* 32; *Kunth, Enum.* 4, *p.* 122. Wet places along the Limpio, and at the Copper Mines; also in Sonora; flowering through the summer and autumn. (No. 1927, *Wright.*)

SCHOLLERA GRAMINIFOLIA, *Willd.* Heteranthera graminea, *Vahl, l. c.; Torr. Fl. N. York*, 2, *p.* 313, *t.* 133. Near Matamoras, in Tamaulipas, on the lower Rio Grande, May; *Schott.* The specimens appear to have grown in very shallow water, or on muddy ground. The stems are scarcely an inch long, and the leaves are only about twice that length.

HYDROCHARIDACEÆ.

LIMNOBIUM SPONGIA, *Bich. in Mem. Instit.* 2, *p.* 66, *t.* 8. Hydrocharis spongiosa, *Bosc.* Near San Antonio, Texas; *Schott.*

COMMELYNACEÆ.

COMMELYNA VIRGINICA, *Linn. Sp. p.* 61; *Gray, Man. ed.* 2, *p.* 486. C. angustifolia *Michx. Fl.* 1, *p.* 24. Moist thickets and borders of rivers. Western Texas, New Mexico, and Chihuahua; flowering throughout the season.

β.? LATIFOLIA: foliis ovatis tenuibus basi obtusis summis cordatis glabris, vaginis ore ciliatis; spatha subtriflora brevi rostrata basi subturbinata.—Shady alluvions of the lower Rio Grande, September; *Schott*. Stem branching, (only the upper part seen,) glabrous. Leaves very thin, 2–3 inches long, 1–1½ inch wide, acute. Flowers only 2 and sometimes a rudiment in one spatha. Sepals and petals nearly as in C. Virginica, but the latter, Mr. Schott says, are white. We need more specimens, in order to determine whether the plant is a distinct species.

COMMELYNA LINEARIS, (*Benth. Pl. Hartw. p.* 27, var. LONGISPATHA:) caule erecto-subramoso; foliis lanceolato-linearibus complicatis, margine scabro; spatha terminali complicata longissime rostrato-attenuata; pedunculis geminis, incluso 8–10-floro, exserto 1–2-floro; petalo impari sessili lateralibus paullo breviore.—Near the Copper Mines, New Mexico, August; *Bigelow*. (No. 700, (in part) 1923 and 1930, *Wright*. No. 864, *Fendler*.) Stem 1–2 feet high, with short axillary branches. Leaves 4–6 inches long, and about a quarter of an inch wide, tapering at each end, slightly pubescent; the sheaths a little swollen, fringed at the orifice. Spatha pedunculate, cordate, not at all turbinate at the base; the narrow tapering somewhat recurved point 1–2 inches long; peduncles of the spatha hispidly pubescent, the terminal one much exserted. Exserted flowering peduncle about an inch long. Exterior sepal ovate, acute, carinate; the two lateral sepals united above the middle, obtuse. Petals bright blue, the lateral ones unguiculate, the odd one about one-third smaller and sessile. Stamens 6; filaments all glabrous; 3 of the anthers abortive and cruciform; the others fertile, oblong, one of them larger and curved. Style long and slender, a little incurved toward the summit. Capsule oblong, one of the cells usually abortive, the other cells 2-seeded. Seeds oblong or roundish, corrugated. A well characterized species, remarkable for the long attenuated apex of the spatha. I first received it from Lieutenant Abert, of the United States army, who collected it on the Pecos river.

TRADESCANTIA VIRGINICA, *Linn. Sp. p.* 412; *Kunth, Enum.* 4, *p.* 81. Valley of the Limpio, July; *Bigelow*. A glabrous narrow-leaved form. No. 1928 and 1929, *Wright*, are other varieties of this polymorphous species.

TRADESCANTIA MICRANTHA (n. sp.): caule subramoso repente linea alterne pubescente; foliis ovatis subamplexicaulibus acutis glabris margine serrulatis, vaginis brevibus ore ciliatis; umbella pauciflora sessili; sepalis obtusiusculis ad carinam hispidulis.—Lower Rio Grande, towards the mouth, October; *Schott*. Stems flaccid, smooth, except the narrow alternate line of pubescence. Leaves about three-fourths of an inch long, and one-third of an inch wide, the two uppermost connate. Umbels only terminal in our specimens. Pedicels 3–8 lines long, nearly smooth. Flowers scarcely one-third of an inch in diameter. Sepals ovate-oblong, equal. Petals pale blue, one-third longer than the sepals, obovate-orbicular. Stamens 6; filaments all bearded; anthers all similar and fertile; the cells separated by a broad connective. Ovary obovate; style long and slender; stigma peltate-capitate. This species has the aspect of Callisia repens.

TRADESCANTIA BIANDRA (n. sp.): caule subramoso erecto glabro, superne nudo; foliis remotis lanceolatis glabris margine ciliolato-scabris, floralibus brevibus acuminatis, vaginis ore nudis; umbella sessili multiflora; pedicellis villosissimis; filamentis imberbibus.—Mountains and moist, rocky places, Puerto de Paysano, September; *Bigelow*. (No. 700, *Wright*.) Stems 12–18 inches high, moderately branched above. Leaves 3–5 inches long, and 6–8 lines wide,

acute, scarcely narrowed at the base; the sheaths wide and short. Floral leaves connate and spreading horizontally, ovate, acuminate, cordate at the base. Umbel 20-40-flowered; the pedicel densely clothed with long white hairs. Sepals oblong, rather obtuse, smooth. Petals roundish-obovate, a little narrowed at the base, deep rose-color. Filaments all smooth, two-thirds the length of the petals; anther-cells separated by a wide connective. Style filiform; stigma capitate-peltate. Cells of the capsule 2-seeded.

Var. BREVIFOLIA: caule prostrato; foliis ovatis approximatis crassiusculis glaucis, vaginis ore ciliatis.—Mountains near the mouth of the Pecos; *Bigelow*. The general appearance of this plant is certainly very unlike that of T. leiandra, but the pedicels and flowers are so similar that I hesitate to separate it as a distinct species.

TRADESCANTIA ANOMALA (n. sp.): caulibus pluribus erectis; foliis inferioribus angusto-lanceolatis basi attenuatis ciliatisque, superioribus ovato-lanceolatis subamplexicaulibus, supremo (spatha?) cordato; racemo terminali paucifloro brevipedunculato; pedicellis brevibus glabris; sepalis ovato-oblongis acutiusculis carinatis; petalis valde inequalibus, lateralibus orbiculari-obovatis, impari rhomboideo parvula; staminibus 6; antheris difformibus; filamentis 3 superne, 2 basi barbatis, una imberbe. Shady woods on the Blanco, Comale, and other rivers, Texas; *Wright*, (No. 699.) San Antonio, Texas; *Thurber*. I have long had Texan specimens from Mr. Wright, from near Austin, &c. The species is intermediate between Tradescantia and Commelyna; resembling the latter in the unequal petals and difformed stamens as well as in the terminal leaf or bract (which is like a spatha laid open); and the former in the 6 fertile stamens with bearded filaments. The plant seems to be an annual, and is a foot or 15 inches high. Lower leaves 4–6 inches long, and half an inch wide in the middle, the tapering base fringed with a few long hairs, otherwise smooth; upper leaves much shorter and rounded at the base. Peduncle 4–6 lines long. Raceme about 5-flowered; pedicels short, with ovate bracteoles at the base. Sepals glabrous, green. The 2 lateral petals bright blue, nearly twice as long as the sepals, odd one rhombic, white, less than one fourth as large as the others. The 3 stamens that are opposite the petals shorter than the others and furnished with oblong anthers; filament of the one opposite the small odd petal beardless, of the 2 lateral ones bearded with purple hairs near the base. The other three stamens have smaller roundish similar anthers; the filament of the middle one winged on each side, from the summit to nearly the base, with a membrane which is fringed with yellow hairs; the other two filaments are bearded only near the summit. Ovary ovate, 2-celled, (one of the cells abortive,) with 2 superimposed ovules in each cell; style long, slender, and somewhat curved above; stigma capitate. Capsule oblong, cells 2-seeded. Seeds as in the rest of the genus.

TRADESCANTIA RHODANTHA (n. sp.): caule erecto simplici glabro; foliis linearibus complicato-falcatis utrinque glabris margine scabriusculis, vaginis ore imberbibus; umbellis terminalibus longe-pedunculatis solitariis compositis 3–4-radiatis; umbellulis 3–4-floris; pedicellis sepala exterioreque (antica?) vix hispidulis; filamentis omnibus barbatis; antheris conformibus. Corallitas, Chihuahua, August; *Thurber*. Root fasciculate. Stem 12–15 inches high, slender. Leaves about 3, the sides folded together. Peduncle 4–6 inches long. In the axil of the upper leaf there is second small umbel. Primary rays of the umbel 1–1½ inch long; pedicels of the buds short and nodding; of the flowers 6–10 lines long. Sepals ovate-oblong, rather obtuse. Petals bright rose-color, orbicular-ovate, about 4 lines long. Stamens half the length of the

petals; filaments bearded with white hairs; cells of the anthers reniform, separated by a broad connective. Style filiform; stigma peltate-capitate. This species resembles T. rosea, but differs in the smooth sheaths, compound umbel, etc. No. 701 of Mr. Wright's Texan collection (1849) seems to be a dwarf state of T. rosea, but our specimens are too imperfect for satisfactory comparison.

CYPERACEAE.

CYPERUS DIANDRUS, *Torr. Cat. Pl. N. York, p. 90, & Cyp. p.* 251. Western Texas; *Wright*, (No. 1749.)

CYPERUS FLAVICOMUS, *Michx. Fl.* 1, *p.* 27; *Torr. l. c. p.* 253. Sonora, Mexico; *Thurber*. (No. 1965, *Wright*.) Our specimens are smaller than the usual form of this species, and the umbel is 2–4-rayed; but in other respects there is no essential difference.

CYPERUS MICRODONTUS, *Torr. p.* 255. C. Gatesii, *Torr. l. c.* Western Texas; *Wright*. A comparison of specimens from numerous localities shows the necessity of uniting these two species.

CYPERUS ARTICULATUS, *Linn.; Torr. l. c. p.* 256. Western Texas; *Wright*.

CYPERUS LATERIFLORUS (n. sp.): umbella capitato-contracta quasi laterali; involucro diphyllo, foliolis valde inequalibus, uno longissimo erecto culmum desinente; spiculis confertis linearibus 12–20-floris; squamis parum remotis suborbiculari-ovatis obtusissimis (ferrugineis) obscure trinerviis; floribus diandris; achenio obovato triquetro pallido scabriusculo nitidulo squama subæquali; stylo trifido. Along mountain torrents, east of Santa Cruz, Sonora; *Wright*, (No. 1950.) Annual. Culms cæspitose, about three inches high, triangular, slightly rough on the angles. Leaves shorter than the culm, rough on the margin. Involucre of 2 very unequal leaves; one of the leaves nearly as long as the culm, of which it appears to be a continuation, the other scarcely one fourth as long. Umbel somewhat capitate and apparently lateral, sometimes with a single short ray. Spikelets 2–3 lines long. Scales light brown on the sides with a pale narrow margin and keel. Rachis very narrow and zigzag, slightly margined. Allied to C. fuscus of Europe.

CYPERUS MICHAUXIANUS, *Schultes, Mant.* 2, *p.* 123; *Torr. Cyp. p.* 259. Wet places, western Texas and New Mexico, westward to the Colorado. No. 1946, Wright, is a dwarf variety. C. speciosus, *Vahl*, or at least of *Torr. Cyp.*, of which we have Californian specimens collected by Rev. A. Fitch, is, perhaps, only a luxuriant form of this species, in which the partial umbels are furnished with conspicuous involucels.

CYPERUS TETRAGONUS, *Ell. Sk.* 1, *p.* 71; *Torr. Cyp. p.* 261. Santa Cruz, Sonora; *Thurber*. Since this plant was noticed in the Monograph of North American Cyperaceæ, I have seen the original specimens of Elliott, and have also received it from east Florida, Louisiana, and Texas. The umbel consists of 4–10 somewhat spreading rays, each bearing a narrowly oblong spike an inch or more in length. The spikes are either simple or they produce 1–3 smaller ones at the base. Spikelets very numerous, obtuse and somewhat quadrangular, crowded on the rachis and spreading horizontally, (or the lower ones reflexed,) about 2 lines long, usually perfecting 2 or 3 achenia. Scales oblong, rather obtuse, light brown on the sides, with a narrow stripe along the obtuse keel. Stamens 3. Style deeply 3-cleft. Achenium oblong, triangular, dull,

embraced by the broad membranaceous margins of the rachilla, which at length separate and appear like 2 inner scales, in which character it accords with the subgenus Papyrus. This species is allied to C. ligularis, *Linn.*

CYPERUS DISSITIFLORUS, *Torr. Cyp. p.* 266. Western Texas; *Wright.* Resembles the last, but is a much smaller plant, with short rays and spikes; the spikelets acute, with narrower scales, etc.

CYPERUS REPENS, *Ell. Sk.* 1, *p.* 69; *Tor. Cyp. p.* 264. C. phymatodes, *Muhl. Gram. p.* 23. Hills near the Copper Mines, New Mexico, and dry ravines on the Limpia, western Texas; *Bigelow.* Sandy river-banks, San Luis Rey, California; *Parry.* (No. 1948, *Wright.*)

CYPERUS SETIGERUS, *Torr. & Hook. in Torr. Cyp. p.* 434. Ravines near Eagle Pass, on the Rio Grande; *Bigelow.* Western Texas; *Wright.*

CYPERUS LUTESCENS, *Torr. & Hook. l. c.* Western Texas; *Wright,* (No. 705.) Perhaps too near the last species.

CYPERUS BALDWINII, *Torr. Cyp. p.* 70. Dry plains between the Pecos and Devil's river; *Bigelow.*

CYPERUS TRACHYNOTUS (n. sp.): culmo valido foliisque glabro obtuse trigono; umbella simplici 3–6-radiata, radiis valde inequalibus; involucro 3–4-phyllo longissimo; spicis subglobosis polystachyis laxiusculis, spiculis lanceolatis compressis 10–14-floris; squamis parum remotis ovatis acuminatis apice subrecurvatis mucronatis, carina superne denticulato-spinulosa; stamina 3; acheniis triquetris basi attenuatis (nigris) squama duplo longioribus. Ravines near the mouth of the Pecos and on Devil's river; *Bigelow, Schott.* (Nos. 704 and 1943, *Wright.*) I have this plant from Key West. It is a well marked species, and does not appear to have been hitherto described.

CYPERUS FILICULMIS, *Vahl, Enum.* 2, *p.* 328; *Torr. Cyp. p.* 267. Western Texas; *Wright.*

CYPERUS OVULARIS, *Torr. Cyp. p.* 278. Mariscus ovularis, *Vahl, Enum.* 2, *p.* 374. Western Texas; *Wright.*

CYPERUS HASPAN, *Linn. Sp. p.* 66; *Kunth, Enum.* 2, *p.* 34. C. gracilis, *Muhl. Gram. p.* 18. C. leptos, *Schultes, Mant.* 2, *p.* 105; *Torr. Cyp. p.* 273. Western Texas; *Wright.*

CYPERUS DRUMMONDII, *Torr. & Hook. in Torr. Cyp. p.* 437. Leone, western Texas; *Bigelow, Wright.* Differs from Drummond's plant, in the somewhat compound umbel, longer rays and larger spikelets with the scales less closely set. We have specimens also from Louisiana and Florida, in which the umbels are compound, but the spikelets are smaller, like those of the original plant.

CYPERUS VIRENS, *Michx. Fl.* 1, *p.* 28; *Torr. Cyp. p.* 275. Moist ravines, western Texas and New Mexico, near the Rio Grande; *Bigelow.*

CYPERUS ARISTATUS, *Rottb; Kunth, Enum.* 2, *p.* 23. C. inflexus, *Muhl. Gram. p.* 16; *Torr. Cyp. p.* 274. Western Texas to California. (Nos. 1951 and 1955, *Wright.*) A widely-spread species, including perhaps most of the Cyperi belonging to the section *Aristati* of Kunth, so far as we can judge from the characters.

CYPERUS SCHWEINITZII, *Torr. Cyp. p.* 276. C. Houghtonii, *Torr. l. c.* Hills near the Copper Mines of New Mexico, and wet places, Rock Creek; *Bigelow.* (Nos. 703, 1944, and 1945, *Wright.*) Our numerous specimens show a gradual transition from C. Houghtonii to C. Schweinitzii.

FUIRENA SQUARROSA, *Michx.* Var. ARISTULATA, *Torr. Cyp. p.* 291. Wet places, Leon Springs, Rio Coleto and other places in western Texas.

ELEOCHARIS EQUISETOIDES, *Torr. Cyp. p.* 296. E. Elliotti, *Dietr. Spec.* 2, *p.* 82, *ex Kunth.* Scirpus equisetoides, *Ell. Sk.* 1, *p.* 79. In water, borders of the San Felipe. Near the Rio Grande, October; *Bigelow.* The nodes of the culm, especially on the upper part, are much more closely approximated than usual.

ELEOCHARIS CELLULOSA, *Torr. Cyp. p.* 298. Boggy banks of the Royo Zaquete, September; *Schott.* Rio Colezo, Texas; *Thurber.* Rutenville in the same State; *Wright.* We have specimens also from Key West, collected by Mr. Blodgett.

ELEOCHARIS PALUSTRIS, *R. Brown, Prodr. p.* 224: *Torr. Cyp. p.* 299. Alluvial soils, in overflowed places, from the Rio Grande to California. A variety with spikes nearly an inch long, and with only rudimentary bristles at the base of the nutlets, was found by Dr. Bigelow near San Elcearío, on the Rio Grande. (Nos. 710, 712, 1934, 1957, and 1960, *Wright.*)

ELEOCHARIS OBTUSA, *Schultes, Mant.* 2, *p.* 89; *Torr. Cyp. p.* 303. Western Texas; *Wright.*

ELEOCHARIS CAPITATA, *R. Brown, Prodr. p.* 225; *Torr. Cyp. p.* 305. On the Rio Coleto, Texas; *Thurber.* (Nos. 1932 and 1933, *Wright.*)

ELEOCHARIS ROSTELLATA, *Torr. Fl. N. York,* 2, *p.* 347. Scirpus rostellatus, *Torr. Cyp. p.* 318. Pedro, Pinta, etc. Santa Rita del Cobra, New Mexico; *Bigelow.* San Bernardino, Sonora; *Thurber.* (Nos. 1931, 1934, and 1956, *Wright.*)

ELEOCHARIS TENUIS, *Schultes, var. β. Torr. Cyp. p.* 310. Western Texas; *Wright,* (No. 713.) In old spikes the scales are deeply bifid, and the divisions acute. The nutlets are pyriform, of a brownish yellow color, very obscurely triangular, with three slightly elevated lines at the angles. The bristles are only rudimentary.

ELEOCHARIS ARENICOLA, *Torr. in Engelm. & Gray, Pl. Lindh. p.* 30. Western Texas; *Wright,* (No. 1958 and 1959.) The plant is much taller (12–15 inches) than the original specimens, and the bristles are barely as long as the nutlets; bnt in other respects there is no difference.

ELEOCHARIS ACICULARIS, *R. Brown, Prodr.* 1, *p.* 224; *Torr. Cyp. p.* 308. Western Texas to California. Wright's No. 1937 is a small form, growing on wet ground.

SCIRPUS OLNEYI, *Gray, in Engelm. & Gray, Pl. Lindh. p.* 30, (*adn.*) *& Man. ed.* 2, *p.* 499. Copper Mines, New Mexico, *Bigelow.* San Bernardino, Sonora; *Thurber.* (No. 1964, *Wright.*) The style is sometimes 3, and even 4-cleft.

SCIRPUS PUNGENS, *Vahl, Enum.* 2, *p.* 255; *Gray, Man. l. c.* Frontera, Texas; *Parry.* (No. 1941 and 1963, *Wright.*) The spikes are oblong or sometimes almost cylindrical, and the style is more frequently 3- than 2-cleft.

SCIRPUS LACUSTRIS, *Linn.; Torr. Cyp. p.* 321. S. validus, *Vahl, Enum.* 2, *p.* 268. S. acutus, *Muhl. Gram. p.* 33. On the Rio Grande and its tributaries, from El Paso to San José, and westward to California. On the valley of the Sacramento, Dr. Hulse, there are thousands of acres covered with this plant, and of the height of 9 or 10 feet. It is called *Tulé* or Giant rush. It varies much in the size of the panicle. The perigynous bristles are mostly narrow and retrorsely hispid, but sometimes broad and retrorsely or horizontally plumose. These characters are not constant, there being intermediate forms. Bentham refers No. 2021 of Hartweg's Californian collection to S. riparius, *Presl,* which Kunth regards as identical with Elytrospermum Californicum, *C. A. Mey.;* which again is the same as the earlier Malacochete of Nees. In our specimen of Hartweg's plant there are four plumose bristles, while Meyer states that there are but two in his Elytrospermum. The number of these organs is, however, by no means constant in this genus, and in every other respect Elytrospermum resembles the form of Sc. lacustris with

broad plumose setæ. Scirpus lacustris of the old world is said to differ from ours in having a 3-cleft style, but in our authentic European specimens the style is 2-cleft.

SCIRPUS MARITIMUS, *Linn.; Torr. Cyp. p.* 323. On the Rio Grande, and westward along the Gila to the Colorado. (No. 1942 and 1962, *Wright.*) The long creeping rhizoma produces one or more ovate farinaceous tubers about an inch in length. They are white inside, and covered with dark brown scales which terminate in long filaments.

FIMBRISTYLIS SPADICEA, *Vahl, Enum.* 2, *p.* 294; *Torr. Cyp. p.* 346. F. cylindrica, *Vahl, l. c.* Leon Springs, western Texas; *Bigelow.*

ISOLEPIS CAPILLARIS, *Roem. & Schultes, Syst.* 2, *p.* 118; *Torr. Cyp. p.* 350. Fimbristylis capillaris, *Gray, Man. ed.* 2, *p.* 503. Oak woods on the Colorado, Texas; *Wright,* (No. 1936 in part.) Var. culmo 1–2-stachyo. Base of the Limpio mountains, and near the Copper Mines of New Mexico; *Bigelow.* (No. 1936, in part, *Wright.*) Culms 3–6 inches high, often bearing only a single spike, and very rarely more than two; the primary one solitary and the other on a ray 2–3 lines long. Involucre of two very unequal leaves, one of which is longer than the ray, the other mostly shorter than the sessile spike. Scales and nutlets as in the ordinary form of the plant.

DICHROMENA LEUCOCEPHALA, *Michx. Fl.* 1, *p.* 37; *Torr. Cyp. p.* 357. Near the Guadalupe river, above Victoria, Texas; *Schott.* (No. 716, *Wright.*)

HEMICARPHA SUBSQUARROSA, *Nees, Cyp. in Endl. & Mart. Fl. Bras. p.* 61, *t.* 4, *f.* 1; *Torr. Fl. New York,* 2, *p.* 362. Scirpus subsquarrosus, *Muhl. Gram. p.* 39. Isolepis subsquarrosa, *Schrad.; Torr. Cyp. p.* 51. Hills near the Copper Mines of New Mexico. (No. 715 and 1936, *Wright.*)

CLADIUM EFFUSUM, *Torr. Cyp. p.* 374. Schœnus effusus, *Swartz; Muhl. Gram. p.* 13. Wet places in elevated valleys on the Limpio; *Bigelow.* Western Texas; *Wright.*

GENUS CAREX.

BY PROFESSOR C. DEWEY.

CAREX HOODII, *Boott, in Hook. Fl. Bor.-Amer.* 2, *p.* 211, *t.* 211. Copper Mines, New Mexico; *Bigelow.*

CAREX DOUGLASII, *Boott, l. c. t.* 214. Copper Mines and other parts, New Mexico; *Bigelow.*

CAREX MARCIDA, *Boott, l. c. t.* 213. River banks near San Luis Rey, California, March; *Parry.* San Bernardino, Sonora, and along the Gila, June; *Thurber.* Camp Tezotat, Sonora; *Thurber, Schott.*

CAREX SICCATA, *Dewey in Sill. Journ.* 29, *p.* 278, *t. F. f.* 18, *&* 14, *p.* 353. C. pallida, *Meyer.* Chihuahua; *Parry.*

CAREX FESTIVA, *Dewey in Sill. Jour.* 29, *p.* 351, *t. W. f.* 71. Monterey, California, April; *Parry.*

CAREX CEPHALOPHORA, *Willd. Sp.* 4, *p.* 220. In woods, western Texas; *Wright.*

CAREX HOOKERIANA, *Dewey in Sill. Jour.* 29, *p.* 248, *t. X. f.* 75. Copper Mines and Rio Mimbres, New Mexico; *Bigelow.* The specimens are numerous, large and small forms, and are well characterized.

CAREX LIDDONI, *Boott, in Hook. Fl. Bor.-Amer.* 2, *p.* 214, *t.* 215. Copper Mines, May; *Thurber.*

CAREX MONTICOLA (Dewey): spicis distinctis erectis breviusculis oblongis; staminifera terminali

solitaria inferne tereti brevi-bracteata cum squamis oblongis obtusiusculis dorso excepto castaneis; pistiliferis 2-sublaxifloris, superiore sessili illi contigua, infima interdum sub-remota vaginata exserte pedunculata; perigyniis 2- vel raro 3-stigmaticis lato-ovatis oblongis convexo-concavis acutiusculis vix rostratis ore integris vel subbifidis subvillosis nervosis, squama lato-ovata acuta vel inferiore mucronata paulo longioribus; foliis vaginatis culmum superantibus.—Mountains east of San Diego, California, *Parry*. Culm 8-10 inches high, scabrous above, leafy; leaves flat, rough on the edges, sheathed to the base and longer than the culm; the lower scales of the perigynium sometimes mucronate and equal to it; the achenium ovate or obovate and convex above. In species where the stigmas are commonly two but sometimes three, the achenium has the lenticular shape belonging to two stigmas, probably the other stigma being abortive.

CAREX RECTA, *Boott; Hook. Fl. Bor.-Amer.* 2, *p.* 220, *t.* 222, *no.* 95. Rio Mimbres, New Mexico, May; *Thurber*.

CAREX STRICTIOR, *Dew.* C. stricta, var. strictior, *Carey in Gray's Man.* Rio Mimbres, New Mexico, May; *Thurber*.

CAREX STRICTA, *Lam.* Rio Mimbres, New Mexico, June; *Bigelow*.

CAREX EMORYI (*Dewey*): spicis staminiferis terminalibus ternis oblongis cylindraceis erectis, superiore longiore brevi-pedunculata, inferioribus sessilibus brevioribus illi contiguis brevi-bracteatis, densifloris, omnibus cum squamis oblongis obovatis obtusis castaneis; spicis pistilliferis 4 longo-cylindraceis densifloris sessilibus longo-foliaceo bracteatis, superioribus apice staminiferis, infima omnino fertili et subremota; perigyniis distigmaticis ellipticis basi teretibus apiculatis vel brevi-rostratis ore integris squama ovata oblonga subacuta duplo longioribus; culmo superne scabro; bracteis evaginatis margine scabris; planta pallido-viridi vel glauca.—The staminate spikes are rather short and contiguous, the upper longest and sub-clubform; pistillate spike 4, rather long, 1½–2 inches, cylindric, erect, sessile, staminate at the apex and bracteate, the lowest wholly fertile and slightly sheathed and nearly sessile; perigynium narrow-elliptic, tapering below, flattish, obovate and apiculate or short and round, rostrate, at the orifice entire, stigmas two; pistillate scale ovate, oblong, acutish, half as long as the fruit; culm triquetrous, scabrous above; bracts scabrous on the margin, long and leafy and surpassing the culm, whole plant pale green or glaucous. On the upper Rio Grande; *Bigelow*.

CAREX DECIDUA (*Boott. in Linn. Trans.* 20, *p.* 119): spicis 3–6 erectis cylindraceis gracilibus atro-purpureis, suprema staminifera brevi-pedunculata clavæformi omnino stamina habente vel sæpe basi aut interdum medio pistillifera, cum squamis oblongis obovatis obtusis dorso albi-nervosis; pistilliferis 1–5, interdum 1–3, sessilibus bracteatis, superioribus 1–3 brevibus parvis contiguis apice staminiferis, inferioribus 2–3 longioribus subremotis foliaceo-bracteatis; perigyniis distigmaticis oblongo-ovatis vel partim obovatis rostellatis inferne teretibus nervatis ore integris, squama oblonga obtusa dorso pallida subduplo longioribus. Banks of rivers, Santa Barbara, California; *Parry*.—Culm 1–1½ foot high, triquetrous and very rough on the edges above, leafy towards the root, and sheathed, rather slender; staminate spike single, about 1½ inch long and rather thick, short-pedunculate, often pistillate at the base, and sometimes in the middle, or both, the rest destitute of pistils; pistillate spikes erect, sessile, rough-bracteate, varying in number, sometimes 1–3 short and approximate, and near the staminate having stamens at the apex with two or three and longer spikes below not androgynous, sometimes only two or three pistillate spikes, of which the upper is short and the lower longer and

more remote; stigmas two; perigynium ovate-oblong or obovate, very short rostrate, entire at the orifice, nerved and lens-like, scarcely stiped; pistillate scale oblong, obtuse, pale on the keel, and near twice as long as the fruit.

CAREX BARBARÆ (*Dewey*): spicis staminiferis terminalibus 2 raro 3 erectis cylindraceis, suprema longa pedunculata, inferiore breviore illi contigua, infima sub-elongata; pistilliferis 3 longo-cylindraceis, 2–4-uncialibus gracilibus, superiore apice staminifera brevi-bracteata erecta, inferioribus longioribus subremotis subrecurvis basi laxifloris brevi-vaginatis foliaceo-bracteatis, omnibus nigro-purpureis; perigyniis distigmaticis oblongis obovatis apiculatis ore integris, squama oblonga obovata dorso pallida mucronata brevioribus; culmo erecto glauco longe-foliato vaginatoque. Banks of streams, Santa Barbara, California; *Parry*.—Culm 16–20 inches high, erect, with long leaves towards the base and long leafy bracts above, glaucous; spikes 3–6, cylindric, slender, blackish-purple; staminate terminal 1–3, commonly 2, the upper nearly two inches long, pedunculate, the lower sessile, contiguous and shorter, the third longer than the last and more remote; pistillate 3, long-cylindric, 2–4 inches long, slender; the upper staminate at the apex, short-bracteate, erect; the lower longer, subremote, subrecurved, loose-flowered at the base and short-sheathed; perigynium oblong-obovate, short-rostrate, entire at the orifice, stigmas 2, pistillate scale oblong-obovate, on the back pale, and the nerve extended into a mucronate point, making the end of the scale sometimes emarginate. The locality gives the name of the species.

CAREX SCHOTTII (*Dew.*): spicis staminiferis terminalibus 3–5 erectis nigro-rubris approximatis prope geminatis cylindraceis, superiore longa 3–unciali medio inflata, inferioribus brevioribus sessilibus contiguis vel infima remotiore et interdum geminata; pistilliferis 3 raro 4 perlongo-cylindraceis gracillimis 6–8 uncialibus perlaxifloris inæqualiter pedunculatis, inferioribus longe pedunculatis folioso-bracteatis basi vaginatis vix fructiferis vel abortivis, cum squamis oblongis arctis obovatis vix acutis; perigynio carente vel nimis immature; culmis superne scabris subprostratis? cum foliis bracteisque viridi glaucis. Banks of rivers, Santa Barbara, California; *Parry*.—This species has very variable spikes and form, as the description shows; spikes 6–8, cylindric; sometimes staminate 5 and pistillate 3, sometimes 4 and 3, sometimes 3 and 3, or again 3 and 4, most of which are long, and some very long; the staminate upper 3 are approximate, so as to be almost geminate, the highest 3 inches long and ventricose in the middle, and the lower a little remote and shorter, often one lower and a little remote and rather long, and on one specimen geminate and one quite short; the staminate scale oblong, obovate, dark red and pale on the back; pistillate spikes 3, rarely 4, very long and slender, 4–8 inches, very loose-flowered, unequally pedunculate, the lowest long pedunculate and long vaginate, all leafy bracteate, with scarcely the rudiment of fruit, or abortive, and with a narrow, oblong, obovate scale scarcely acute; perigynium wanting, or too immature; culm triquetrous above and scabrous, with glaucous leaves and bracts. This species has some affinity to C. Darwinii, *Boott. in Trans. Linn.* 20, *p.* 120, but the numerous differences far separate the two. There may have been some crushing of the culms to account for their prostrate appearance, without which, at least, the pistillate spikes must have been long-retrocurved as in C. pendula, *Gooden.*

CAREX PHYLLOSTACHYS, *Meyer, Trans. Acad. St. Petersb.* Collected in California by Dr.

Parry. Clearly distinct from Carex Geyeri, *Boott.*, and closely related to Carex Wildenowii, *Schk.*

CAREX UMBELLATA, *Schk. Car. II, p. 75, t. Wo w. fig.* 171, var. VICINA, *Dew. in Sill. Journ. 9, p. 31, & 11, p. 316, t. D. f.* 13. Often with three pistillate spikes near the staminate spike, as well as the radical spikes, on the same tuft. Woods on the Colorado and Blanco rivers, Texas; *Wright*. In both these localities, the plant described and drawn by *Schk.*, and the variety also abound together, the latter most common.

CAREX THURBERI (*Dewey*): spicis 4 oblongo-cylindraceis pedunculatis foliaceo-bracteatis; spica staminifera terminali solitaria sublonga cum squamis oblongis obtusis mucronatis fulvis; pistilliferis 3 subcrassis vix nutantibus densifloris sub-approximatis, superioribus vix vaginatis, infima cum pedunculo sublongiore vaginato exserto; perigyniis tristigmaticis ovato oblongis multo-nervosis subventricosis brevi-conico-rostratis bidentatis squama brevi-oblonga obtusa dorso trinervata scabro-aristata longioribus vel basi spicarum brevioribus; culmis et foliis margine scabris.—Mabibi, Sonora, June; *Thurber*.—Culm two feet high, erect, scabrous above and smooth below the spikes, leafy towards the base; upper leaf vaginate and long as culm, and with the leafy bracts rough on the edges; staminate spike single, erect, long, and bracteate; pistillate spikes three, oblong, cylindric, thickish, densely flowered, pedunculate, the lowest vaginate, with an exsert peduncle; stigmas three; perigynium ovate or oblong, many-nerved, tapering into a shortish beak, bidentate, some inflated or ventricose; pistillate scale short, oblong, obtuse, scabrous cuspidate, shorter than the fruit, except at the base of the spikes it is longer. This differs much from C. hystricina, *Willd.*, to which it is related.

CAREX HYSTRICINA, *Willd. Spec. Plant.* 4, *p.* 232. On the banks of the Limpio, Texas; and at Santa Rita del Cobre, New Mexico; *Bigelow*.

CAREX WRIGHTII (*Dewey*): spicis staminiferis 2; raro 3; oblongo cylindraceis erectis, terminali longiore brevi-pedunculata, secunda brevi illa contigua sessili raro remotiuscula, tertia remotiore, omnibus bracteatis cum squama oblonga acuta castanea inferne aristata; spicis pistilliferis 2–3 oblongo cylindraceis gracilibus sublaxifloris remotis exserte pedunculatis, superiore apice staminifera evaginata, infima longe vaginata et longe exserta, omnibus foliaceo-bracteatis; perigyniis tristigmaticis ovatis subconicis subtriquetris brevi-rostratis multo-nervatis ore bilabiatis subscabris vix ventricosis squama ovato-oblonga cuspidata paulo longioribus vel inferne paulo brevioribus. In woods on the Colorado of Texas, and near the Rio Grande; *Wright*. Culm about a foot high, erect or flaccid, with subradical flat nerved vaginate leaves and leafy bracts nearly equalling the culm; spikes 3–6, oblong-cylindric; staminate 2, upper an inch long and pedunculate, the lower one-third as long and commonly close to it, rarely a third, which is remotish, and all bracteate; pistillate spikes 2–3, remote and pedunculate, the upper staminate at the apex, the lower longer pedunculate and exsert; all rather loosely flowered, especially towards the peduncle; stigmas three; perigynium ovate, sub-conic, slightly triquetrous, short and round, rostrate, many-nerved, bilabiate and subscabrous; scale ovate-oblong, rough cuspidate, a little shorter than the fruit, except on the lower part of the spike where it often surpasses the fruit. Differs from C. scabrata, *Schw.*, to which it is nearly related in the number of staminate spikes, and in various particulars of the fertile spikes and their fruit. Named after Mr. C. Wright, one of the exploring party.

CAREX LANUGINOSA, *Michx. Flor. Bor.-Amer.* 2, *p.* 175. Rio Mimbres and Santa Rita del Cobre, New Mexico; *Bigelow, Thurber*.

EQUISETACEÆ.*

EQUISETUM ARVENSE, *Linn.; Pursh, Fl.* 2, *p.* 651; *Braun & Engelm. in Sill. Jour.* 46, *p.* 83; *Torr. Fl. N. York*, 2, *p.* 480. Near the Mimbres, New Mexico; *Thurber*. Small sterile specimens.

EQUISETUM LÆVIGATUM, *Braun & Engelm. l. c.* Banks of the Rio Grande, near El Paso, and near the Coper Mines.

EQUISETUM ROBUSTUM, *Braun & Engelm. l. c.* Banks of the Rio Grande.

FILICES.

WOODWARDIA RADICANS, *Willd. Sp.* 5, *p.* 418; *Hook. & Arn. Bot. Beech. p.* 162 *&* 405. W. Chamissoi, *Brack. Ferns of the U. S. Expl. Exped. p.* 138. Between San Diego and the Colorado; *Schott*.

ADIANTUM CAPILLUS-VENERIS, *Linn.; Hook. Sp. Fil.* 2, *p.* 36. From San Antonio to the Rio Grande, and northward to New Mexico; common along running streams.

ADIANTUM CHILENSE, *Kaulf. Enum. p.* 207; *Hook. l. c. p.* 43. California, Texas; *Wright*, (No. 2123.)

Var. HIRSUTUM, *Hook. l. c. p.* 43, *t.* 75, *B.* A. pilosum, *Fée, Gen. Fil. p.* 118. Rocks near the mouth of the Pecos; *Bigelow*.

PTERIS AQUILINA, *Linn.* Var. *β.* LANUGINOSA, *Hook. Fl. Bor.—Am.* 2, *p.* 263; *Brack. l. c. p.* 119. P. lanuginosa, *Hook. & Arn. Bot. Beech. p.* 405; *Agardh, Gen. Pterid.* 51.? Between San Diego and the Colorado; *Schott*.

PELLÆA FLEXUOSA, *Link. Fil. Sp. p.* 60; *Fée, Gen. Fil. p.* 129. Allosorus, *Kunze; Schk. Fil. Supp.* 1, *p.* 46, *t.* 23. Pteris, *Hook. Ic. Pl.* 2, *t.* 119. On running streams near the Rio Grande, and along the San Pedro and the Gila. (No. 825, *Wright*.)

PELLÆA ANDROMEDÆFOLIA, *Fée, l. c.* Allosorus andromedæfolius, *Kunze, Anal. Pterid. p.* 18, *t.* 11. Pteris, *Kaulf. Enum. Fil. p.* 188. Between San Diego and the Colorado; *Schott*.

PELLÆA PULCHELLA, *Fée, l. c.* Allosorus pulchellus, *Mart. & Gal. Fil. Mex. p.* 47, *t.* 10, *fig.* 1. A. formosus, *Liebmann, Mex. Breg. p.* 68. From Howard's Springs and the Pecos to the San Pedro and the Waterholes; *Bigelow, Schott*. (No. 824, *Wright*.)

PELLÆA MUCRONATA. Allosorus mucronatus, *D. C. Eaton in Sill. Jour.* (*ser.* 2,) 64, *p.* 138; *Torr. Bot. Whippl. Rep. p.* 160. Pellæa Wrightiana, longimucronata, & Ornithopus, *Hook. Sp. Fil.* 2, *p.* —, *t.* 115 & 116, (*ined.*) On rocks from the Rio Grande, westward, to the Colorado and California. (No. 2130 and 2131, *Wright*.) This fern varies in height from two inches to over a foot. In its simplest state the upper pinnæ are trifoliate, and the lower quinquefoliate; from this it varies to a state in which the secondary rachis bear numerous and minute trifoliate pinnules. Some of the forms resemble P. ternifolia, *Link. l. c.*, (Pteris ternifolia, *Hook. & Grev. Ic. Fil.* 2, *t.* 126,) but have not the narrow linear outline of that species, nor its obovate-cuneate sterile pinnules.

PELLÆA ATROPURPUREA, *Link. l. c.* Pteris atropurpurea, *Willd. Sp. Pl.* 5, *p.* 375; *Pursh, l. c.* 2, *p.* 668. Platyloma atropurpurea, *J. Smith; Torr. Fl. New York*, 2, *p.* 488. Allosorus atropurpureus, *Presl. Tent. Pterid. p.* 153.; *Gray, Manual*, 2*d ed. p.* 591 Along the Mimbres, New Mexico; *Bigelow*.

* This and the following orders of Acrogens were elaborated by Daniel C. Eaton, esq., of the Scientific School of Yale College. The Grasses will be the subject of a separate report, to be published in the Smithsonian contributions.

CHEILANTHES WRIGHTII, *Hook. Sp. Fil.* 2, *p.* 87, *t.* 110, *A.* Near the Rio Grande and the Gila.

CHEILANTHES ALABAMENSIS, *Kunze in Sill. Jour.* (2*d ser.*) 6, *p.* 87; *Hook. l. c. p.* 89, *t.* 103, *B.* Rocky and shady ravines, at the mouth of the Pecos; *Bigelow.* On the lower Rio Grande, *Schott.*

CHEILANTHES TOMENTOSA, *Link. l. c. p.* 65; *Hook. l. c. p.* 96, *t.* 109, *A.* From the Rio Grande westward along the Gila to the Colorado.

CHEILANTHES LANOSA. C. vestita, *Hook. l. c. p.* 98, *t.* 108, *B.* Nephrodium lanosum, *Michx. Fl. Bor.-Am.* 2, *p.* 270? Myriopteris gracilis, *Fée, l. c. p.* 150, *t.* 29, *f.* 6. Along the Rio Grande; *Wright.* The name of C. vestita unquestionably belongs to the fern described and figured by Professor Gray under that name in the *Manual*, (2*d ed.*) *p.* 592, *t.* 10.

CHEILANTHES LINDHEIMERI, *Hook. l. c. p.* 101, *t.* 107, *A.* At the Copper Mines and in Wild-rose Pass; *Bigelow, Schott.*

CHEILANTHES FENDLERI, *Hook. l. c. p.* 103, *t.* 107, *B.* Near the Copper Mines, New Mexico; *Bigelow.* Sonora; *Parry.* Some of the specimens are fully a foot high, and have the pinnæ more remote than usually.

CHEILANTHES ASPERA, *Hook. l. c. p.* 111, *t.* 108, *A.* Lower Rio Grande; *Schott.* Near the Copper Mines and along the San Pedro; *Bigelow.* The characters of a new species of this interesting genus are subjoined.

CHEILANTHES GRACILLIMA (sp. nov.): fronde lineari-oblonga bipinnata; pinnis pinnulisque confertis, pinnulis sessilibus ovatis obtusis superne pauciter albo-pilosis subtus tomento denso fulvo obtectis, margine reflexo involucrem continuum efficienti.—Stipites ebenei plures ecaudice paleaceo subrepente erecti. Rachides primarii secundariique cum stipite juniore paleis gracilibus instructi. Cascade mountains of Oregon at 7,000 feet of altitude, latitude 44°, collected by Dr. Newberry in Williamson's Expedition, and by Dr. Bigelow in Whipple's Expedition. A very delicate little fern of the *Lendigera* group. Stipes 2–3 inches long; frond half as long, and 3–5 lines wide; pinnæ 7–10 pairs; pinnules 2–3 pairs.

HYPOLEPIS CALIFORNICA, *Hook. l. c. p.* 71, *t.* 88, *A.* Collected between San Diego and the Colorado; *Schott.*

NOTHOCHLÆNA RUFA, var. *β. Presl, Reliq. Hænke.* 1, *p.* 19; *Martens & Galeotti, l. c. p.* 45; *Leibmann, l. c. p.* 62. Cheilanthes ferruginea, *Willd. Herb.*; *Link. l. c. p.* 65. Along the San Pedro and Rio Grande, and on the Organ mountains of New Mexico.

NOTHOCHLÆNA SINUATA, *Kaulf. l. c. p.* 135; *Kunze in Schk. Fil. Supp.* 1, *p.* 95, *t.* 65. Acrostichum, *Swartz, Syn. p.* 14. Western Texas from San Antonio to the Rio Grande, and along that river northward to New Mexico. *C. Wright, No.* 814, (1849.) A variety of this species having smaller and crenated, not pinnatifid pinnæ with whiter ciliated scales beneath, and a denser stellate pubescence above, looking through a lens like newly fallen snow, was collected in rocky places near the San Pedro and the Gila.

NOTHOCHLÆNA PULVERACEA, *Kunze in Linnæa*, 13, *p.* 135, & 18, *p.* 338; *Liebmann, Mex. Bregn. p.* 63. Lower Rio Grande; *Schott.* Rocky places on the Pecos and San Pedro; *Bigelow.* No. 820 and 2124, *Wright.* Kunze and Liebmann consider this distinct from Cheilanthes pulveracea, *Presl, Rel. Hænk.* 1, *p.* 64; *Hook. Sp. Fil.* 2, *p.* 78.

NOTHOCHLÆNÆ CRETACEA, *Liebmann l. c. p.* 64? At Painted Camp and at the entrance to Wild-rose Pass; *Bigelow, Schott. C. Wright, No.* 821, (1849.) Our plant agrees well with the description cited, but has not been compared with authentic specimens. It grows in tufts about 6–8 inches high, and has much the appearance of Gymnogramme triangularis, *Kaulf.;*

the frond being five angled and covered beneath with a dense light-yellow farina. Stipes stout, reddish brown and shining; frond 1–2 inches long and fully as wide.

NEUROGRAMME PEDATA, *Link, Fil. Sp. p.* 139; *Fée, Gen. p.* 168. Hemionitis, *Swartz, Syn. Fil. p.* 20 & 209, *t.* 1, *f.* 3. Along the Rio Grande, San Pedro, and Gila; mostly on rocks.

GYMNOGRAMME TRIANGULARIS, *Kaulf. Enum. p.* 73; *Hook. & Grev. Ic. Fil. t.* 153; *Hook. Fl. Bor.-Am.* 2, *p.* 259. Between San Diego and the Colorado; *Schott.*

ASPLENIUM SEPTENTRIONALE, *Hoffmann, Deutschlands Flora,* 2, *p.* 12; *Hook. & Arn. Brit. Flor. ed.* 7, *p.* 588; *Lindley & Moore, Nature Printed Ferns, t.* 41, *C.* On Ben Moore, New Mexico, May; *Bigelow.* (No. 2122, *Wright.*)

ASPLENIUM TRICHOMANES, *Linn.; Torr. Fl. New York,* 2, *p.* 491; *Lindl. & Moore, l. c. t.* 39. New Mexico; *Wright,* (No. 2121.)

ASPLENIUM EBENEUM, *Willd. Sp. Pl.* 5, *p.* 329; *Pursh, Fl.* 2, *p.* 666; *Torr. Fl. New York,* 2, *p.* 492. In the Great Cañon of the Rio Grande; *Parry.*

POLYPODIUM CALIFORNICUM, *Kaulf. Enum. p.* 102; *Hook. & Arn. Bot. Beech. p.* 161 & 405; *Hook. Fl. Bor.-Am.* 2, *p.* 258. (*Excl. Syn. Hook. & Grev. Ic. Fil. t.* 56.) San Diego; *Bigelow.*

POLYPODIUM INCANUM, *Willd. Sp. Pl.* 5, *p.* 174; *Pursh, Fl.* 2, *p.* 659; *Gray, Manual, p.* 590. On igneous rocks near the Great Cañon of the Rio Grande; *Parry.*

LASTREA PATENS, *Presl, Tent. Pterid. p.* 75; *Liebmann, l. c. p.* 119. Aspidium, *Sw.; Willd. Sp. Pl.* 5, *p.* 244; *Hook. & Arn. Bot. Beech. p.* 162. A. molle, *Kunze in Sill. Jour. (ser.* 2) 6, *p.* 83. Common in western Texas and near the Rio Grande. This fern is found from Florida to Texas and in California, (*Bot. Beech. l. c.*) Our specimens agree with those from the Kew Gardens in Herb. Gray, and do not present the venation of Nephrodium molle so well shown in *Schott's Genera Filicum.*

LASTREA ARGUTA, *Brack. l. c. p.* 196. Aspidium argute, *Kaulf. l. c. p.* 242; *Torr. Bot. Whippl. Rep. p.* 160. Between San Diego and the Colorado. In *Lindley & Moore Nat. Print. Ferns,* 18, this is said to be only a larger and more developed form of L. rigida, *Presl.*

POLYSTICHUM MUNITUM, *Presl, l. c. p.* 83; *Brack. l. c. p.* 203. Aspidium munitum, *Kaulf. l. c. p.* 236; *Hook. Fl. Bor.-Am.* 2, *p.* 261. Between San Diego and the Colorado.

PHANEROPHLEBIA NOBILIS, *Presl, l. c. p.* 85; *Liebmann, l. c. p.* 124. Aspidium nobile, *Schlecht. Linnæa* 5, *p.* 610; *Kunze in Schk. Fil. Supp.* 1, *p.* 155, *t.* 67. A. pumilum, *Mart. & Gal. l. c. p.* 64, *t.* 17, *f.* 1. Hueco tanks in western Texas, and at Van Horn's Well.

WOODSIA OBTUSA, *Torr. Catal. pl. N. Y. Fl. N. Y.* 2, *p.* 500; *Hook. Sp. Fil.* 1, *p.* 62. W. Perriniana, *Hook. & Grev. Ic. Fil. t.* 68. Hills near the Copper Mines. The specimens are all small, and the pinnules are crisped and glandularly ciliated. The same form occurs on the Columbia river.

ANEMIA MEXICANA, *Klotsch in Linnæa,* 18, *p.* 526; *Kunze in Schk. Fil. Supp.* 2, *p.* 75, *t.* 131; *Hook. Ic. Pl.* 988. Clefts of rocks in a deep arroyo near the mouth of the Pecos, and at Medina creek. (No. 826 and 2117, *Wright.*)

LYCOPODIACEÆ.

SELAGINELLA RUPESTRIS, *Spring, Monog. Lycop.* 2, *p.* 55. Lycopodium rupestre, *Linn.; Hook. Fl. Bor.-Am.* 2, *p.* 267. Along the Rio Grande at Eagle Pass and at the mouth of the Pecos, &c.; *Schott, Bigelow.* (No. 2116, *Wright.*) Var. *β. Hook. l. c. excl. syn. Presl.* S. struthioloides *Torr. Bot. Whippl. Rep. p.* 159, *excl. syn. Presl.* Mountains near El Paso; *Wright.* Organ

mountains, New Mexico; *Bigelow*. Lyc. struthioloides, *Presl.* referred by Hooker, and following him by Dr. Torrey, to the slender variety of the above, was considered by Spring (*l. c.* 1, p. 32) a form of *Lyc. taxifolium*, though he says he did not carefully examine the original specimen in the Imperial herbarium at Vienna.

SELAGINELLA LEPIDOPHYLLA, *Spring, l. c. p.* 72. Lycopodium lepidophyllum, *Hook. Ic. Pl.* 2, *t.* 162, 163. In the valley of the Rio Grande, and near the San Pedro, mostly on lime rock. *C. Wright*, No. 2114, (1851–2).

HYDROPTERIDES.

MARSILEA UNCINATA, *A. Braunin Sill. Jour.* (2*d ser.*) 3, *p.* 55. New Mexico; *Dr. Bigelow*, No. 166.

MARSILEA VESTITA, *Hook. & Grev. Ic. Fil. t.* 159. San Elcoario on the Rio Grande and elsewhere in western Texas. *C. Wright*, No. 2112, (1851–2).

MARSILEA MACROPODA, *A. Braun, l. c.* Western Texas and along the Rio Grande. *C. Wright*, No. 2111 (1851–2).

AZOLLA CAROLINIANA, *Willd. Sp.* 5, *p.* 541; *Torr. Fl. N. York*, 2, *p.* 513. Rio San Antonio, and Rio Gila.

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DESCRIPTION OF THE PLATES.

PLATE I. CLEMATIS LASIANTHA.—Page 29.

A PORTION OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A perfect flower. Fig. 2. A head of carpels on its peduncle; of the natural size.

PLATE II. DELPHINIUM.—Page 30.

UPPER PORTION OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A sepal; enlarged. Fig. 2. One of the upper petals; equally enlarged. Fig. 3. One of the lower petals; also enlarged. Fig. 4. A stamen; magnified. Fig. 5. The three pistils; also magnified.

PLATE III. DENDROMEEON RIGIDUM.—Page 32.

A. A FLOWERING PORTION OF THE PLANT. B. A PORTION IN FRUIT.

Fig. 1. A flower bud; magnified. Fig. 2. A stamen; more magnified. Fig. 3. An ovule; still more magnified. Fig. 4. A seed; equally magnified. Fig. 5. The same; longitudinally divided. Fig. 6. The embryo; highly magnified.

PLATE IV. ISOMERIS ARBOREA.—Page 35.

UPPER PORTION OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. Plan of the flower. Fig. 2. A flower bud. Fig. 3. An expanded flower. Fig. 4. A petal. Fig. 5. A stamen. Fig. 6. Cross section of the anther. Fig. 7. A flower from which the petals have been removed, showing the torus and its appendages. Fig. 8. Transverse section of the ovary. Fig. 9. A seed, seen in front. Fig. 10. The same; side view. Fig. 11. Longitudinal section of the same. Fig. 12. The embryo. All the figures more or less magnified.

PLATE V. FRANKENIA GRANDIFOLIA.—Page 35.

A BRANCH OF THE NATURAL SIZE.

Fig. 1. A flower. Fig. 2. Transverse section of the calyx. Fig. 3. A flower, with the calyx and part of the petals removed. Fig. 4. A petal, showing the inner side. Fig. 5. A stamen, showing the posterior side. Fig. 6. The pistil. Fig. 7. The ovary, divided longitudinally. Fig. 8. Transverse section of the same. All the figures more or less enlarged.

PLATE VI. THURBERIA THESPESIOIDES.—Page 40.

A BRANCH OF THE NATURAL SIZE.

Fig. 1. A flower, divided longitudinally; the corrolla removed; enlarged. Fig. 2. Transverse section of the ovary; also enlarged. Fig. 3. Fruit of the natural size. Fig. 4. The fruit enlarged and longitudinally divided. Fig. 5. Transverse section of the same. Fig. 6. A seed, longitudinally divided and enlarged. Fig. 7. The embryo.

PLATE VII. LITHRÆA LAURINA.—Page 44.

A. A FLOWERING BRANCH. B. A BRANCH WITH FRUIT: BOTH OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Figs. 2 and 3. These figures are incorrect, as they do not show the disk upon which the petals and stamens are inserted. Fig. 4. The pistil; more magnified. Fig. 5. The same, longitudinally divided. Fig. 6. The ovule; more magnified. Fig. 7. A drupe, with the persistent calyx. Fig. 8. The same, longitudinally divided.

PLATE VIII. HOLACANTHA EMORYI.—Page 45.

Fig. 1. A flowering branch of the sterile plant. Fig. 2. A branch of the fertile plant. Fig. 3. A branch in fruit: all the figures of the natural size. Fig. 4. A flower bud, from the sterile plant. Fig. 5. A sterile flower; and Fig. 6. The same, longitudinally divided. Fig. 7. An inside view of a magnified stamen. Fig. 8. An outside view of the same. Fig. 9. Compound pistil of a fertile flower; magnified. Fig. 10. The same, longitudinally divided and more magnified. Fig. 11. A drupe, magnified; and Fig. 13. The same, longitudinally divided. Fig. 12. The carpophore.

PLATE IX. CEANOTHUS RIGIDUS.—Page 45.

A, A FLOWERING, AND B, A FRUCTIFEROUS, BRANCH, OF THE NATURAL SIZE.

Fig. 1. A flower; magnified. Fig. 2. The pistil; more magnified. Fig. 3. The ovary; stil[1] more magnified, and longitudinally divided. Fig. 4. Transverse section of the same. Fig. 5. The persistent base of the calyx.

PLATE X. CEANOTHUS DENTATUS.—Page 46.

A FLOWERING BRANCH, OF THE NATURAL SIZE.

Fig. 1. A flower; magnified. Fig. 2. Petal from a bud. Fig. 3. Stamen, from the same. Fig. 4. Petal and stamen from an open flower. Fig. 5. Pistil and disk; the ovary with three fleshy protuberances at the summit. Fig. 6. Transverse section of the ovary. Fig. 7. Longitudinal section, showing one of the cells laid open, and showing the erect ovule. Fig. 8. A separate ovule. All the figures more or less magnified.

PLATE XI. CEANOTHUS CRASSIFOLIUS.—Page 46.

A FLOWERING BRANCH, OF THE NATURAL SIZE.

Fig. 1. An expanded flower; magnified. Fig. 2. An unexpanded flower; also magnified. Fig. 3. A petal and stamen from the same. Fig. 4. Transverse section of the ovary; more magnified. Fig. 5. Portion of the ovary; more highly magnified; showing one of the cells with its contained ovule.

PLATE XII. POLYGALA NUTKANA.—Page 49.

A PLANT OF THE NATURAL SIZE.

Fig. 1. A flower laid open; moderately enlarged. Fig. 2. Sepals; *a*, the upper odd one; *b*, a lateral upper one; *c*, a wing. Fig. 3. Corolla laid open, showing the stamens; magnified. Fig. 4. An anther, considerably more enlarged. Fig. 5. The pistil; magnified. Fig. 6. A capsule divided longitudinally, showing the pendulous seeds, considerably magnified. Fig. 7. Transverse section of the same. Fig. 8. A seed; more highly magnified.

PLATE XIII. KRAMERIA CANESCENS.—Page 49.

A PORTION OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. Plan of the flower. Fig. 2. A flower bud and bracteoles; somewhat enlarged. Fig. 3. An expanded flower; more enlarged. Fig. 4. The three upper petals. Fig. 5. The two lower fleshy and glandular petals; one an inside view, the other an outside view; the last two figures considerably magnified. Figs. 6–8. Different magnified views of a stamen, (fig. 6 shows the vertical opening.) Fig. 9. The pistil; moderately enlarged. Fig. 10. The same considerably magnified and divided longitudinally. Fig. 11. Transverse section of the same. Fig. 12. The ovules, or rather young seeds detached. Fig. 13. A seed; considerably magnified. Fig. 14. A fruit of the natural size. Fig. 15. The upper part of one of the barbed prickles of the fruit pretty highly magnified.

PLATE XIV. PICKERINGIA MONTANA.—Page 51.

A BRANCH OF THE NATURAL SIZE.

Fig. 1. The vexillum. Fig. 2. One of the wings. Fig. 3. A keel-petal. Fig. 4. A flower with part of the calyx and the corolla cut away. The preceding figures moderately enlarged. Fig. 5. Part of a stamen; considerably magnified. Fig. 6. The pistil, equally maginfied, and the ovary longitudinally divided. Fig. 7. An immature seed; more highly magnified.

PLATE XV. HOSACKIA GRACILIS.—Page 54.

A PLANT OF THE NATURAL SIZE, IN FLOWER AND FRUIT.

Fig. 1. A flower somewhat enlarged. Fig. 2. Separate petals; magnified; *a*, the vexillum; *b*, one of the wings; *c*, one of the keel petals. Fig. 3. A seed; considerably magnified.

PLATE XVI. ASTRAGALUS (PHACA) LEUCOPSIS.—Page 56.

A. UPPER PART OF THE PLANT OF THE NATURAL SIZE. B. A PEDUNCLE BEARING MATURE PODS.

Fig. 1. A flower with the petals removed; moderately enlarged. Fig. 2. Separate petals; *a*, the vexillum; *b*, one of the wings; *c*, the keel. Fig. 3. The stamens and pistil; more magnified. Fig. 4. The pistil with its stipe; equally magnified. Fig. 5. The ovary laid open; more magnified. Fig. 6. A very young seed; considerably magnified. Fig. 7. Transverse section of a pod, of the natural size. Fig. 8. A seed; considerably magnified.

PLATE XVII. ASTRAGALUS CROTALARIÆ.[1]—Page 56.

A. UPPER PART OF THE PLANT. B. A RACEME OF PODS: BOTH OF THE NATURAL SIZE.

Fig. 1. A separate flower; moderately enlarged. Fig. 2. The keel; more enlarged. Fig. 3. The stamens, with the pistil enclosed in the sheath of filament; equally magnified. Fig. 4. The pistil detached. Fig. 5. An ovule; pretty highly magnified.

PLATE XVIII. CHÆTOCALYX SCHOTTII.—Page —.

A FLOWERING BRANCH OF THE NATURAL SIZE.

Fig. 1. The petals separated; *a*, the vexillum; *bb*, the wings; *c*, the keel; moderately magnified. Fig. 2. Lower portion of a wing; more magnified. Fig. 3. The monadelphous stamens and the exserted style; still more magnified. Fig. 4. Pistil with the cavity of the ovary laid open; equally magnified. Fig. 5. Flower from which the corolla has fallen; less magnified. Fig. 6. Immature pod, showing the wing-like termination; moderately enlarged. Figs. 7 and 8. Pods of C. Wislizeni, of the natural size. Fig. 9. A seed of the natural size. Fig. 10. The embryo detached and magnified.

PLATE XIX. ACÆNA PINNATIFIDA.—Page 63.

A PLANT OF THE NATURAL SIZE.

Fig. 1. An expanded flower; considerably magnified. Fig. 2. The calyx, shown separately and equally magnified. Fig. 3. Part of a stamen; more magnified. Fig. 4. A flower divided longitudinally, considerably magnified. Fig. 5. The pistil detached and equally magnified. Fig. 6. An ovule.

PLATE XX. ADENOSTOMA SPARSIFOLIA.—Page 63.

A BRANCH OF THE NATURAL SIZE.

Fig. 1. A flower with bracts at the base of the calyx; magnified. Fig. 2. The same with the bracts cut away. Fig. 3. A portion of the flower, more magnified; showing a petal and three stamens. Fig. 4. The pistil; equally magnified. Fig. 5. The ovary of the same laid open, and exposing one of the ovules. Fig. 6. Transverse section of the ovary. Fig. 7. Fructiferous calyx, with the persistent filaments, magnified. Fig. 8. The fruit detached from the same.

PLATE XXI. ROSA GYMNOSPERMA.—Page —.

A FLOWERING BRANCH OF THE NATURAL SIZE.

Fig. 1. A petal; enlarged. Fig. 2. A stamen; considerably magnified. Fig. 3. Longitudinal section of a flower, showing the pistils in the ventricose calyx-tube; the petals removed; enlarged. Fig. 4. A detached pistil; more enlarged. Fig. 5. Longitudinal section of the ovary; magnified. Fig. 6. Cross section of the same; equally magnified.

[1] Incorrectly named Astragalus crotalarioides on the plate.

PLATE XXII. PETALONYX THURBERI.—Page 67.

UPPER PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. Hairs of the leaves and stem; highly magnified. Fig. 2. An expanded flower, with its bract and bracteoles; considerably magnified. Fig. 3. The same, with the petals and stamens removed; more magnified. Fig. 4. A petal; equally magnified. Fig. 5. Part of a stamen. Fig. 6. Longitudinal section of the ovary. Fig. 7. The fruit. Fig. 8. Longitudinal section of the same; the last four figures considerably magnified.

PLATE XXIII. RIBES MENZIESII.—Page 68.

A BRANCH OF THE NATURAL SIZE.

Fig. 1. A flower, with the calyx and corolla longitudinally divided; enlarged. Fig. 2. Limb of a petal; considerably magnified. Fig. 3. A stamen; the lower part of the filament cut off; equally magnified. Fig. 4. Transverse section of the ovary; enlarged. Fig. 5. An ovule detached; magnified.

PLATE XXIV. ECHEVERIA LANCEOLATA.—Page 69.

A PLANT OF THE NATURAL SIZE, (WITHOUT THE ROOT.)

Fig. 1. A flower; enlarged. Fig. 2. A portion of the flower laid open; more enlarged. Fig. 3. The pistils; magnified. Fig. 4. One of the pistils, considerably magnified and divided longitudinally. Fig. 5. Transverse section of the same. Fig. 6. A detached ovule highly magnified. Fig. 7. A ripe carpel; magnified.

PLATE XXV. SAXIFRAGA PARRYI.—Page 69.

AN ENTIRE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. Inside view of a portion of a flower; more enlarged. Fig. 3. A petal and stamen, showing their insertion on the calyx; still more enlarged. Fig. 4. The ovary; considerably magnified. Fig. 5. Transverse section of the ovary; more magnified. Fig. 6. Fructiferous calyx; enlarged. Fig. 7. A seed; pretty highly magnified. Fig. 8. The same longitudinally divided. Fig. 9. A transverse section of the same. Fig. 10. The embryo detached and more highly magnified.

PLATE XXVI. DEWEYA ARGUTA.—Page 70.

UPPER PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. Fruit, moderately enlarged. Fig. 2. Upper portion of the same, considerably magnified. Fig. 3. Transverse section of the same, and the position of the petals indicated.

PLATE XXVII. EURYPTERA LUCIDA.—Page 70.

ENTIRE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. A petal; more enlarged. Fig. 3. The fruit; enlarged. Fig. 4. Transverse section of the same; considerably magnified. Fig. 5. Longitudinal section

of a carpel in the direction of the shorter diameter; magnified. Fig. 6. The embryo detached and highly magnified.

PLATE XXVIII. APIASTRUM ANGUSTIFOLIUM.—Page 71.

AN ENTIRE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; magnified. Fig. 2. A petal, (incorrectly drawn.) Fig. 3. A stamen; more magnified. Fig. 4. A fruit; pretty highly magnified. Fig. 5. The carpophore, with one of the carpels attached. Fig. 6. Transverse section of the fruit; highly magnified. Fig. 7. A seed; and Fig. 8, the nucleus detached; much magnified.

PLATE XXIX. LONICERA SUBSPICATA.—Page 71.

PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. A berry; equally enlarged.

PLATE XXX. DICORIA CANESCENS.—Page 87.

PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A staminate flower; considerably magnified. Fig. 2. The same, with the corolla laid open, showing the monadelphous filaments deprived of their anthers. Fig. 3. A grain of pollen; highly magnified. Fig. 4. Abortive style of the staminate flower. Fig. 5. A head of flowers; the two large interior involucral scales nearly concealing the flowers; enlarged. Fig. 6. A ripe achenium; more enlarged. Fig. 7. One of the scales of the receptacle; magnified.

PLATE XXXI. TUCKERMANIA MARITIMA.—Page 92.

UPPER PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A ray-flower; enlarged. Fig. 2. A disk-flower; also enlarged. Fig. 3. Two of the stamens, their filaments united by one edge; more highly magnified. Fig. 4. The pistil; equally magnified. Fig. 5. An achenium; enlarged. Fig. 6. Cross section of the same; more enlarged.

PLATE XXXII. ACARPHÆA ARTEMISRÆFOLIA.—Page 95.

THE ENTIRE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; magnified.

PLATE XXXIII. ACTINOLEPIS MULTICAULIS.—Page 96.

AN ENTIRE PLANT OF THE NATURAL SIZE.

Fig. 1. A ray-flower; magnified. Fig. 2. A disk-flower; also magnified.

PLATE XXXIV. RAFINESQUIA CALIFORNICA.—Page 106.

UPPER PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. Grains of pollen; highly magnified. Fig. 3. Achenia; magnified; *a*, an interior one; *b*, an exterior one.

PLATE XXXV. NEMACLADUS RAMOSISSIMUS.—Page 108.

A. A YOUNG PLANT WITH RADICAL LEAVES. B. A FULL GROWN PLANT IN FRUIT: BOTH OF THE NATURAL SIZE.

Fig. 1. A flower; considerably magnified. Fig. 2. Another view of a flower. (I have not verified the correctness of this figure.) Fig. 3. A petal; more magnified. Fig. 4. The stamineal column; equally magnified. Fig. 5. Part of a stamen; more magnified. Fig. 6. Stigma and part of the style; highly magnified. Fig. 7. Cross section of a capsule; considerably magnified. Fig. 8. A seed; highly magnified.

PLATE XXXVI. EMORYA SUAVEOLENS.—Page 121.

A BRANCH OF THE NATURAL SIZE.

Fig. 1. The calyx; magnified. Fig. 2. The corolla; equally magnified. Fig. 3. The same, laid open, showing the insertion of the stamens and the pistil; more magnified. 3*a*, anther and portion of the filament; more highly magnified. Fig. 4. Capsule; also magnified. Fig. 5. Transverse section of the same. Fig. 6. A seed; highly magnified. Fig. 7. The embryo; separated and still more highly magnified. Fig. 8. Plan of the flower.

PLATE XXXVII. SPHACELE CALYCINA.—Page 131.

UPPER PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. The corolla, laid open, showing the stamens and pistil. Fig. 2. The 4-lobed ovary, gynophore, and lower part of the style.

PLATE XXXVIII. AUDIBERTIA GRANDIFLORA.—Page 132.

UPPER PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. The corolla, laid open and more enlarged.

PLATE XXXIX. SALAZARIA MEXICANA.—Page 133.

A PORTION OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. The corolla, laid open, showing the stamens and pistil. Fig. 3. One of the superior stamens; magnified. Fig. 4. The inflated fructiferous calyx; magnified. Fig. 5. A nutlet; considerably magnified. Fig. 6. The same, longitudinally divided.

PLATE XL. TRICHOSTEMA LANATUM.—Page 134.

UPPER PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. The corolla, laid open and more enlarged.

PLATE XLI. TETRACLEA COULTERI.—Page 134.

A PLANT OF THE NATURAL SIZE.

Fig. 1. The corolla laid open; enlarged. Fig. 2. The pistil; equally enlarged. Fig. 3. The ovary; more enlarged. Fig. 4. Transverse section of the same; still more enlarged. Fig.

5. A seed; magnified. Fig. 6. The fruit and fructiferous calyx; one of the nutlets removed; magnified. Fig. 7. Inside view of a nutlet; equally magnified. Fig. 8. Transverse section of a nutlet; back view. Fig. 9. Longitudinal section of the same. Fig. 10. The embryo; equally magnified.

PLATE XLII. ERYTHRÆA CHIRONIOIDES.—Page 156.

AN ENTIRE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. One of the divisions of the calyx; magnified. Fig. 3. Calyx and fruit; magnified. Fig. 4. A seed; more highly magnified.

PLATE XLIII. ECHITES MACROSIPHON.—Page 158.

A PLANT OF THE NATURAL SIZE.

Fig. 1. A flower, with the narrow portion of the tube and the calyx cut away, and the upper part laid open; enlarged. Fig. 2. A stamen; magnified. Fig. 3. The stigma, with an anther adhering to it; equally magnified. Fig. 4. Longitudinal section of the ovaries; also magnified. Fig. 5. A placenta, with the ovules attached. Fig. 6. A seed with its tuft of hairs at the summit; magnified.

PLATE XLIV. ACERATES TOMENTOSA*.—Page 160.

UPPER PORTION OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. One of the pollen masses suspended from a gland of the stigma; considerably magnified. Fig. 3. A pod of the natural size.

PLATE XLV. A. ASCLEPIAS NUMMULARIA.—Page 163.

A PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. One of the hoods; magnified. Fig. 3. The same, laid open and showing the horn. Fig. 4. An anther, inside view; considerably magnified. Fig. 5. A pair of pollen masses attached to a gland of the stigma; more highly magnified. Fig. 6. A pod of the natural size.

PLATE XLV. B. ASCLEPIAS MACROTIS.—Page 164.

A PLANT OF THE NATURAL SIZE.

Fig. 1. A flower; enlarged. Fig. 2. One of the hoods; magnified. Fig. 3. The same laid open. Fig. 4. An anther, seen from the inside; considerably magnified. Fig. 5. A pair of pollen masses; more highly magnified.

PLATE XLVI. ACLEISANTHES LONGIFLORA.—Page 170.

A PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. Upper part of the perianth laid open. Fig. 2. Lower portion of the same. Fig. 3. A stamen; magnified. Fig. 4. The ovary laid open; magnified. Fig. 5. The fruit; enlarged.

*Incorrectly named Asclepias in the plate.

Fig. 6. Transverse section of the same; more enlarged. Fig. 7. The embryo detached. Fig. 8. Side view of the same.

PLATE XLVII. A. SELINOCARPUS ANGUSTIFOLIUS.—Page 170.

AN ENTIRE PLANT OF THE NATURAL SIZE.

Fig. 1. The perianth laid open; enlarged. Fig. 2. The fruit; also enlarged. Fig. 3. Longitudinal section of the same. Fig. 4. Transverse section of the same; more enlarged. Fig. 5. The embryo detached; equally magnified. Fig. 6. Side view of the same.

PLATE XLVII. B. PENTACROPHYS WRIGHTII.—Page 170.

A PORTION OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A transversely divided fruit from a precociously fructified unexpanded flower; enlarged. Fig. 2. A fruit from an expanded flower; equally enlarged. Fig. 3. The same; of the natural size.

PLATE XLVIII. MIRABILIS CALIFORNICA.—Page. 169.

UPPER PART OF THE PLANT OF THE NATURAL SIZE.

Fig. 1. A flower, with its involucre, enlarged. Fig. 2. The same, laid open. Fig. 3. A fruit, about four times the natural size.

PLATE XLIX. SIMMONDSIA CALIFORNICA.—Page 202.

A. A FLOWERING BRANCH OF THE MALE PLANT. B. A BRANCH OF THE FEMALE PLANT.

Fig. 1. A male flower; enlarged. Fig. 3. The same, with the stamens removed. Fig. 2. An anther; more enlarged. Fig. 4. The ovary; magnified and longitudinally divided. Fig. 5. An ovule, more highly magnified. Fig. 6. Longitudinal section of the same. Fig. 7. A seed, somewhat enlarged. Fig. 8. Longitudinal section of the same. Fig. 9. Transverse section of the same.

PLATE L. CELTIS PALLIDA.[1]—Page 203.

A. A FLOWERING BRANCH OF THE NATURAL SIZE. B. A FRUCTIFEROUS BRANCH.

Fig. 1. Plan of the flower. Fig. 2. An expanded sterile flower; magnified. Fig. 3. A stamen from the same. Fig. 4. A cluster of flowers, the terminal perfect; magnified. Fig. 5. Pistil, with the ovary longitudinally divided. Fig. 6. A droop, with the upper half of the sarcocorp cut away; enlarged. Fig. 7. Transverse section of a seed. Fig. 8. The embryo detached.

PLATE LI. QUERCUS ACUTIDENS.—Page 207.

A BRANCH WITH FRUIT; OF THE NATURAL SIZE.

PLATE LII. PILOSTYLES THURBERI.—Page ——.

THE PLANTS, CONSISTING OF SINGLE FLOWERS, PARASITIC ON DALEA SCHOTTII.

Fig. 1. Magnified longitudinal section of a branch of the Dalea, showing the mode of attachment of the parasite. Fig. 2. A fertile flower; magnified. Fig. 3. Transverse section of the

[1] Named *C. cinerea* on the plate.

same. Fig. 4. Longitudinal section of the same. Fig. 5. An ovule detached and highly magnified.

PLATE LIII. PINUS LLAVEANA.—Page 208.

A BRANCH OF THE NATURAL SIZE.

Fig. 1. A mature cone. Fig. 2. The same, with the scales expanded. Fig. 3. A seed: all the figures of the natural size.

PLATE LIV. PINUS MURICATA.[a]—Page 209.

A. A BRANCH WITH STAMINATE CATKINS OF THE NATURAL SIZE.
B. A CONE OF THE NATURAL SIZE.

PLATE LV. PINUS INSIGNIS.—Page. 209.

A. A BRANCH OF THE NATURAL SIZE.
B. A CONE OF THE NATURAL SIZE.

PLATE LVI. PINUS DEFLEXA.—Page 209.

LEAVES OF THE NATURAL SIZE.

Fig. 1. A cone. Fig. 2. A seed; both of the natural size.

PLATE LVII. PINUS SABINIANA.—210.

A BRANCH WITH LEAVES, AND A CONE OF THE NATURAL SIZE.

PLATES LVIII AND LIX. PINUS TORREYANA.—Page. 210.

A BRANCH WITH LEAVES, AND A CONE OF THE NATURAL SIZE.

PLATE LX. CHLOROGALUM POMERIDIANUM.—Page —.

UPPER AND LOWER PORTION OF THE PLANT, OF THE NATURAL SIZE.

Fig. 1. A sepal and stamen; enlarged. Fig. 2. Transverse section of the ovary; magnified. Fig. 3. An ovule; highly magnified.

PLATE LXI. FRITILLARIA LANCEOLATE.—Page —.

A AND B. BROAD AND NARROW LEAVED FORMS OF THE PLANT, OF THE NATURAL SIZE.

Fig. 1. An exterior sepal; enlarged. Fig. 2. An interior sepal; equally enlarged. Fig. 3. A stamen; magnified.

[a] Named *P. edgariana* on the plate.

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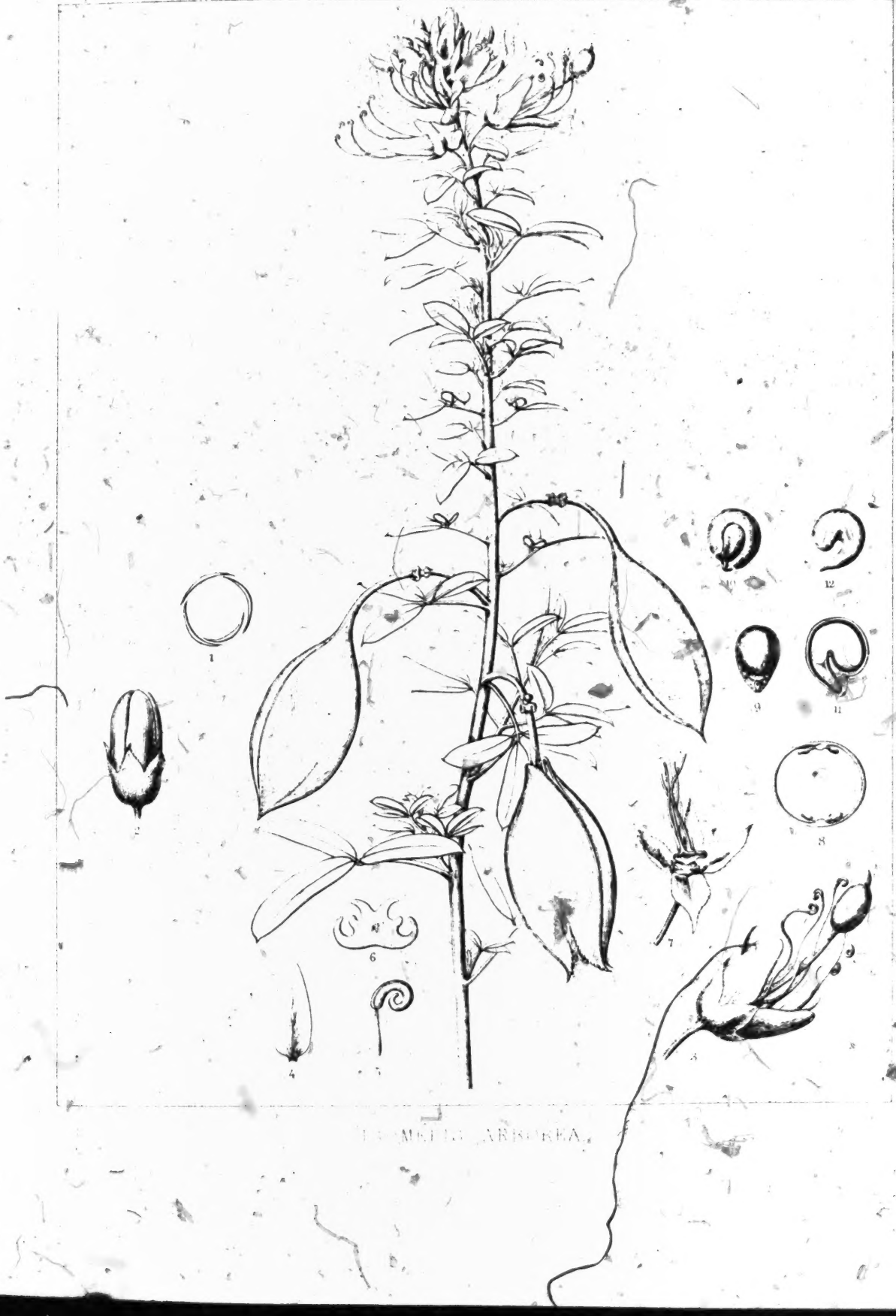
DELPHINIUM CARDINALE

DENDROMECON RIGIDUM.



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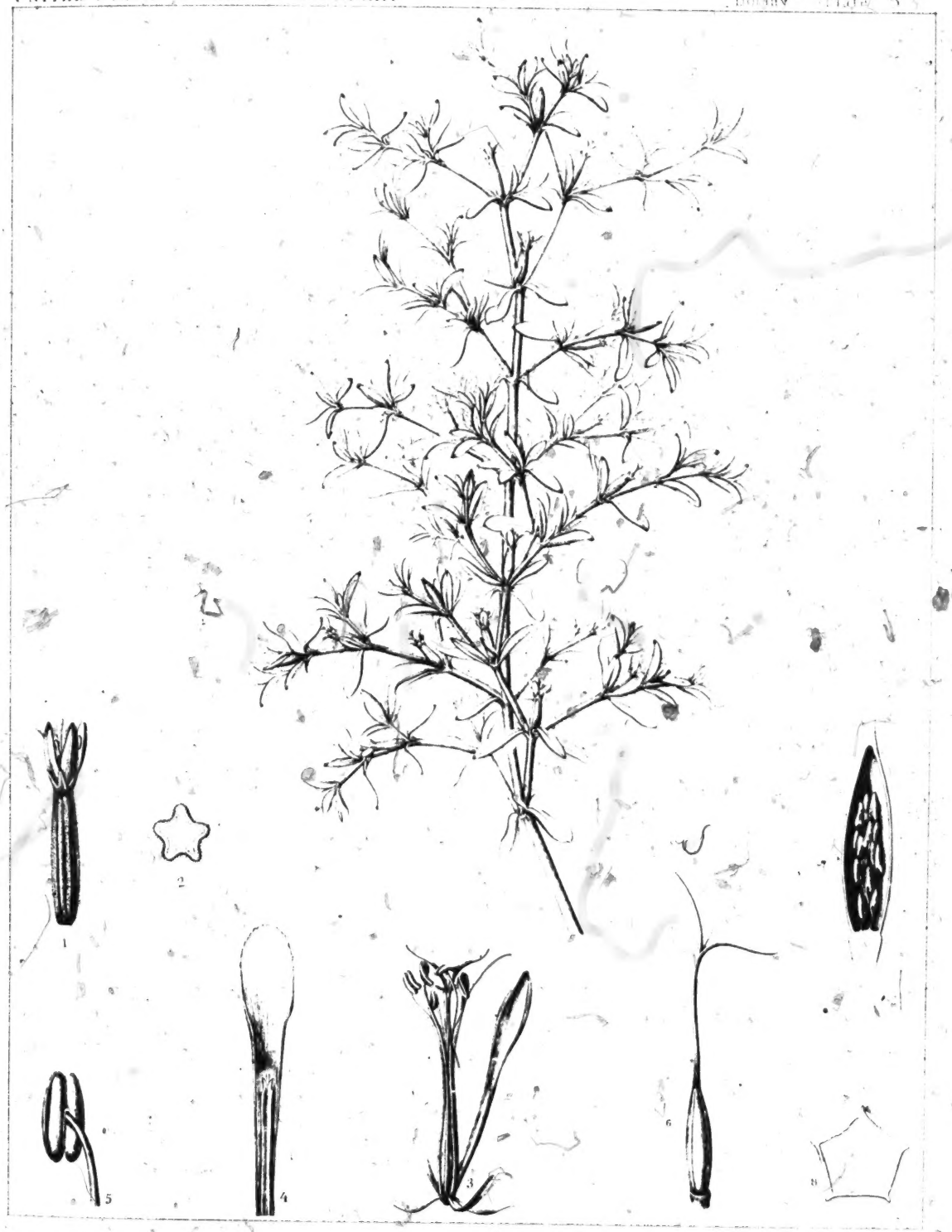

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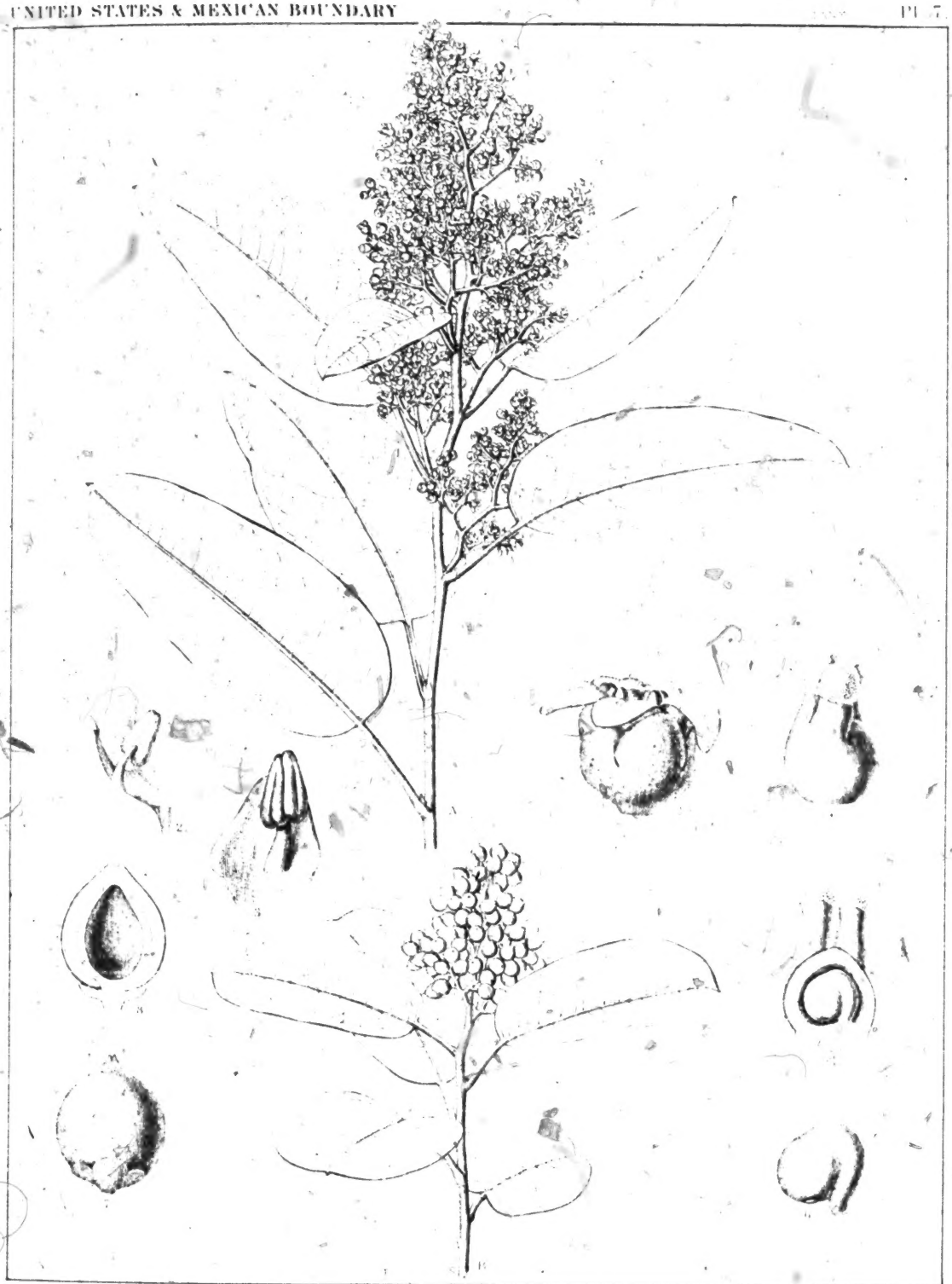

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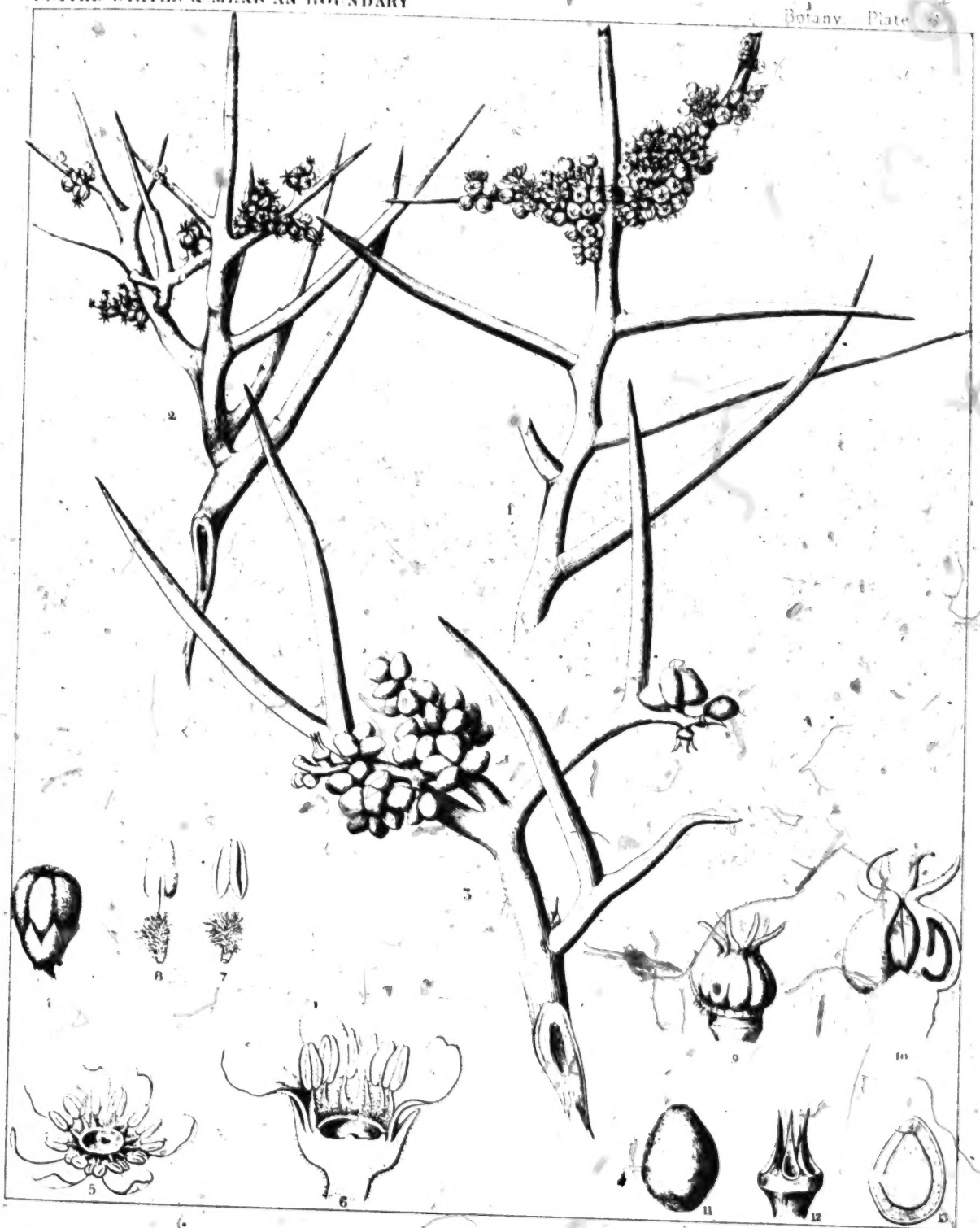

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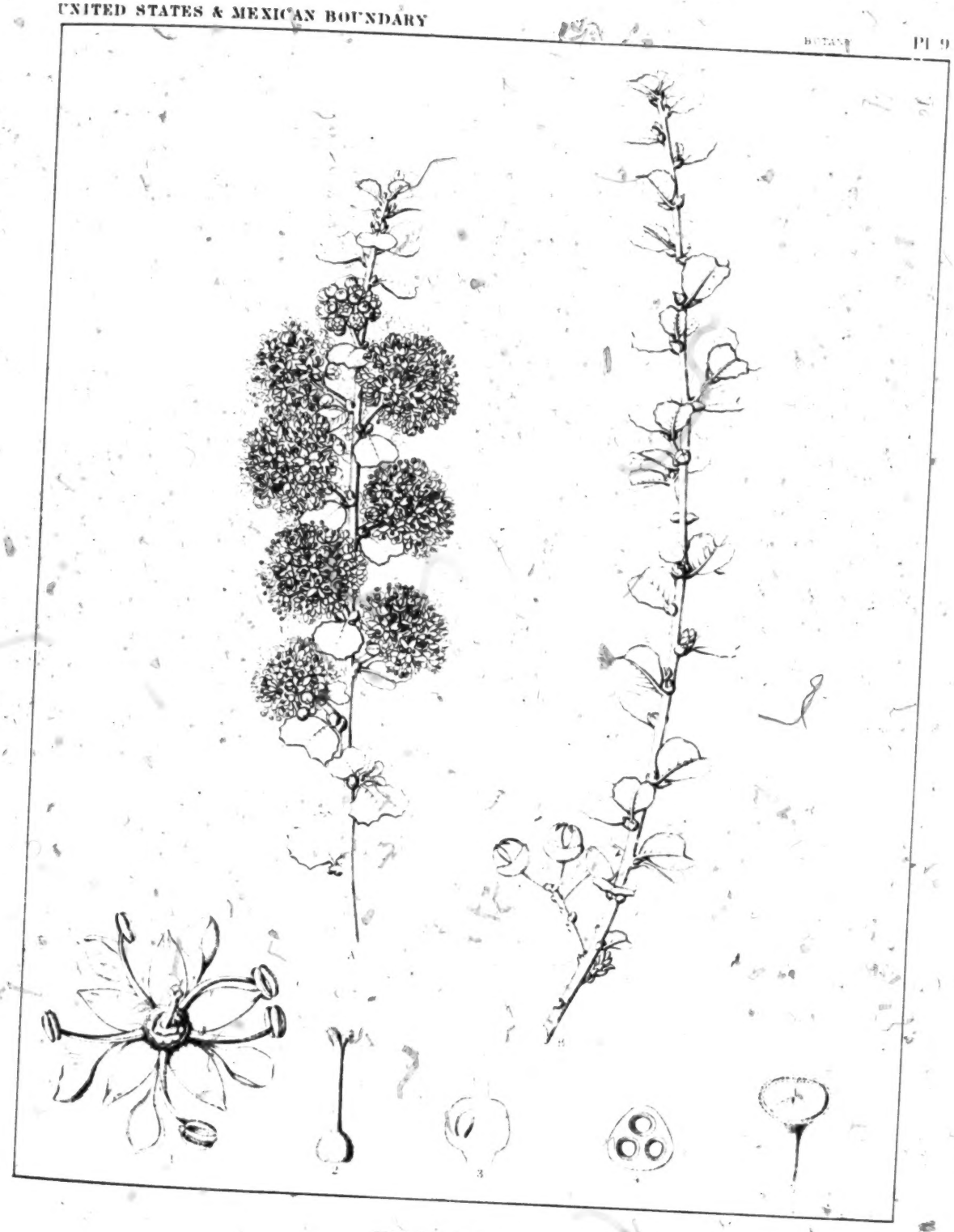

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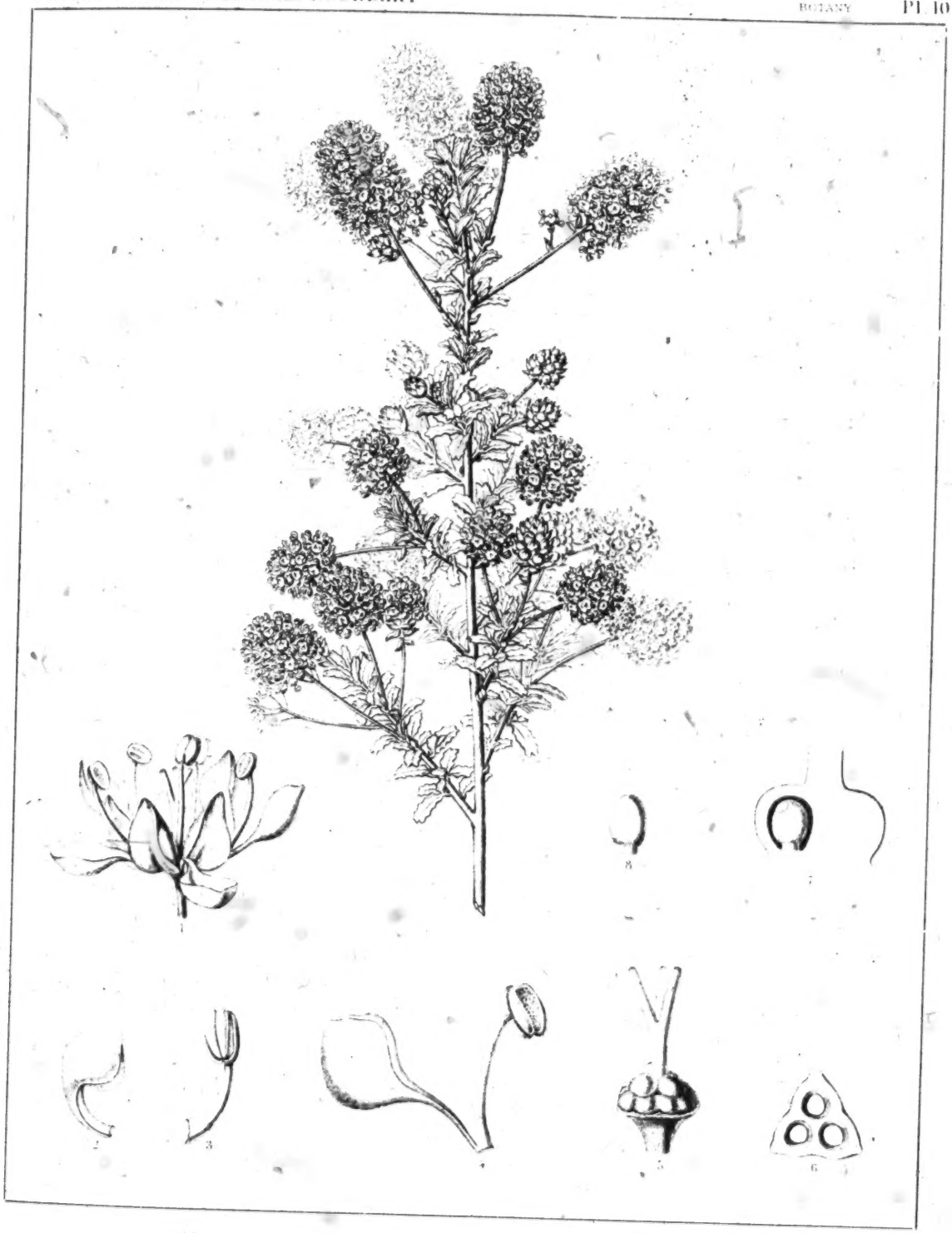

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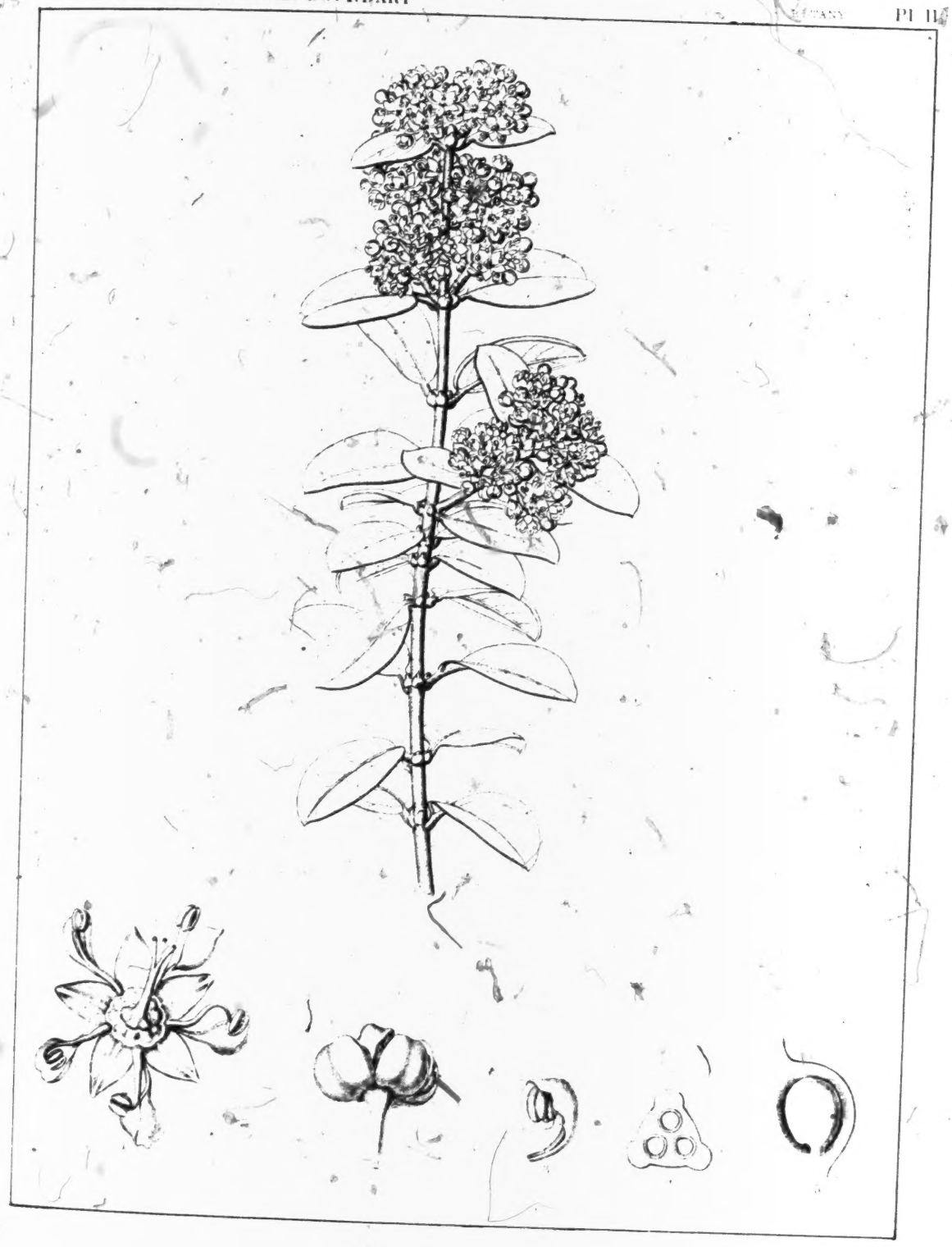

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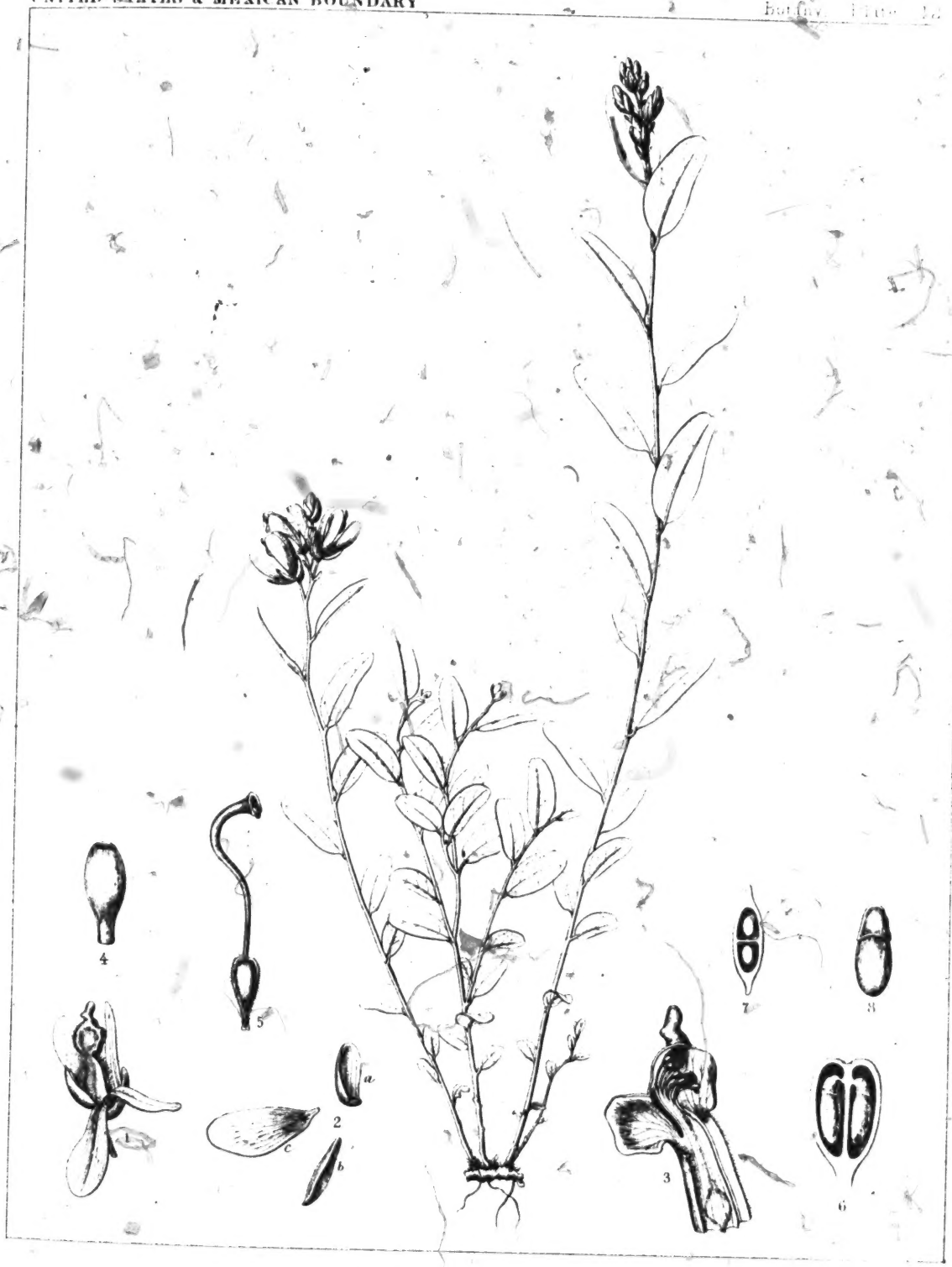

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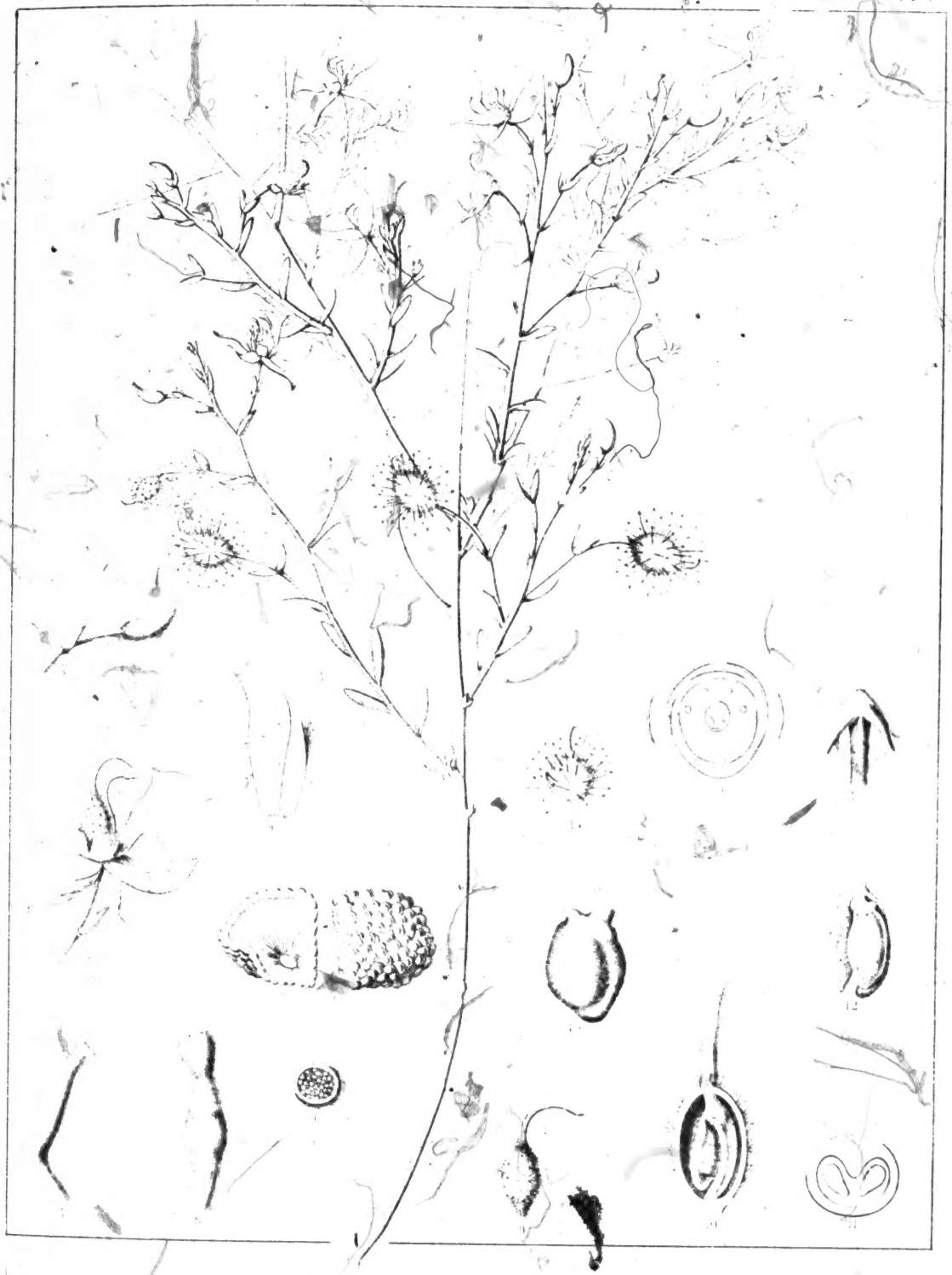

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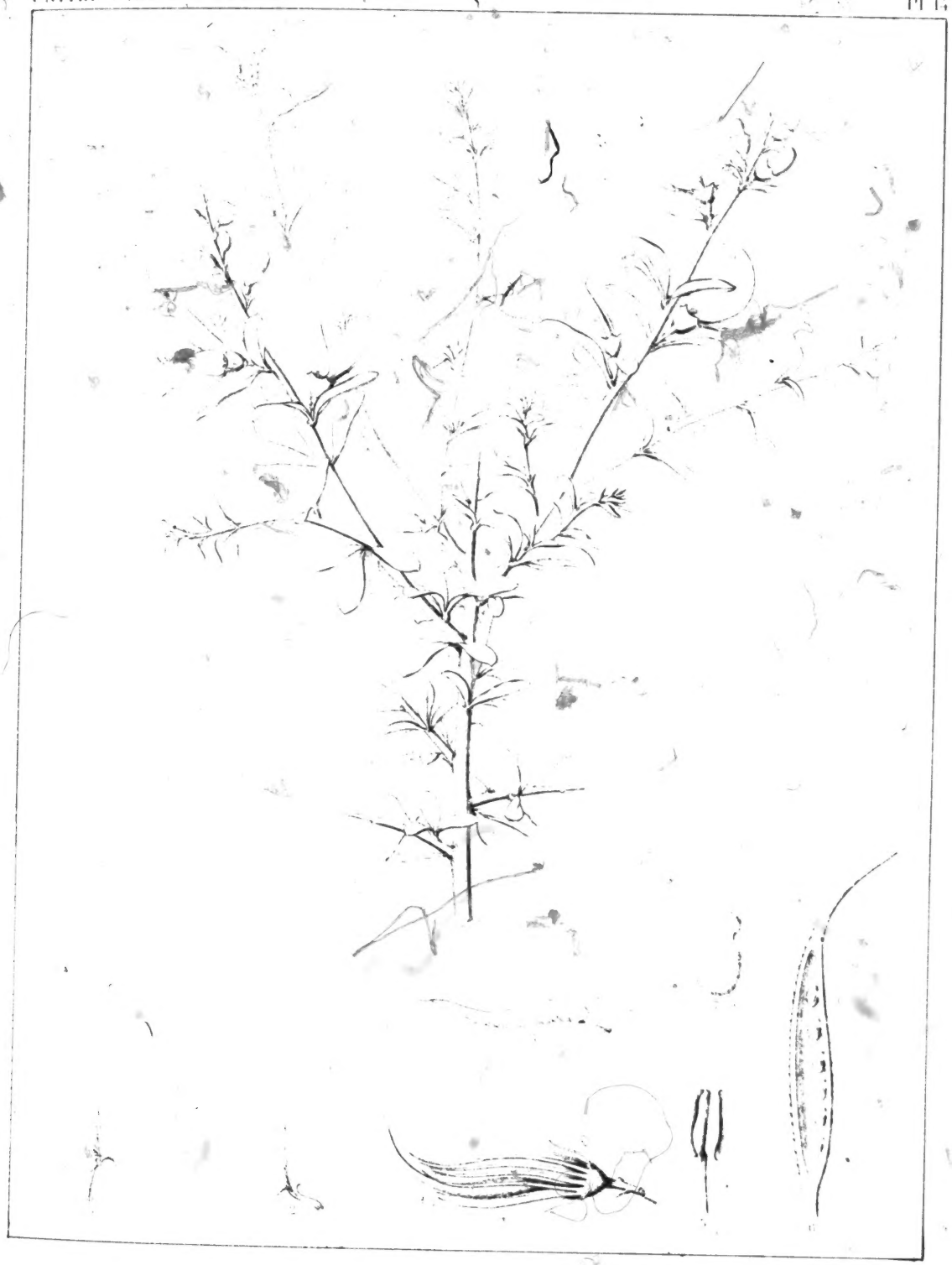

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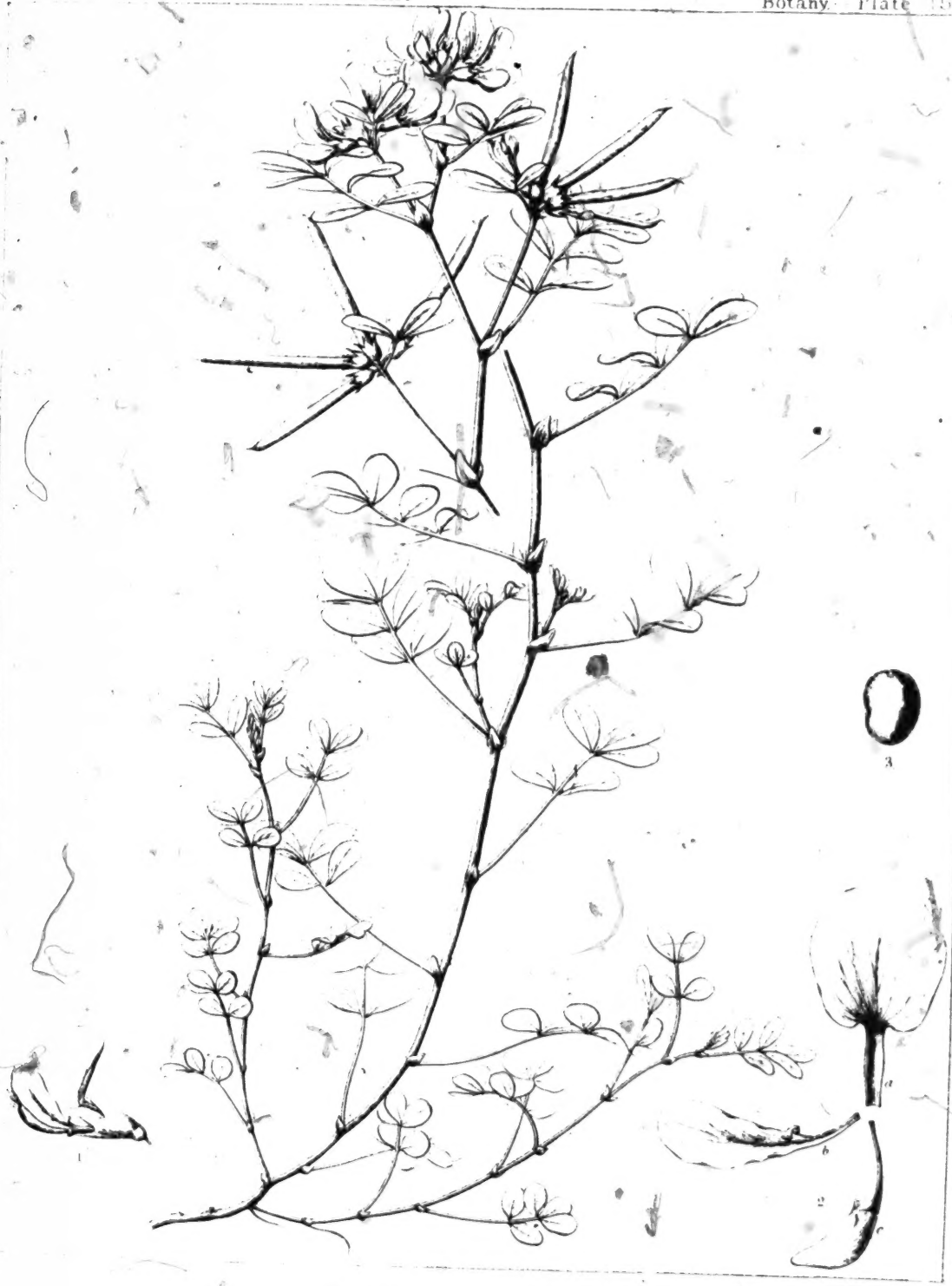

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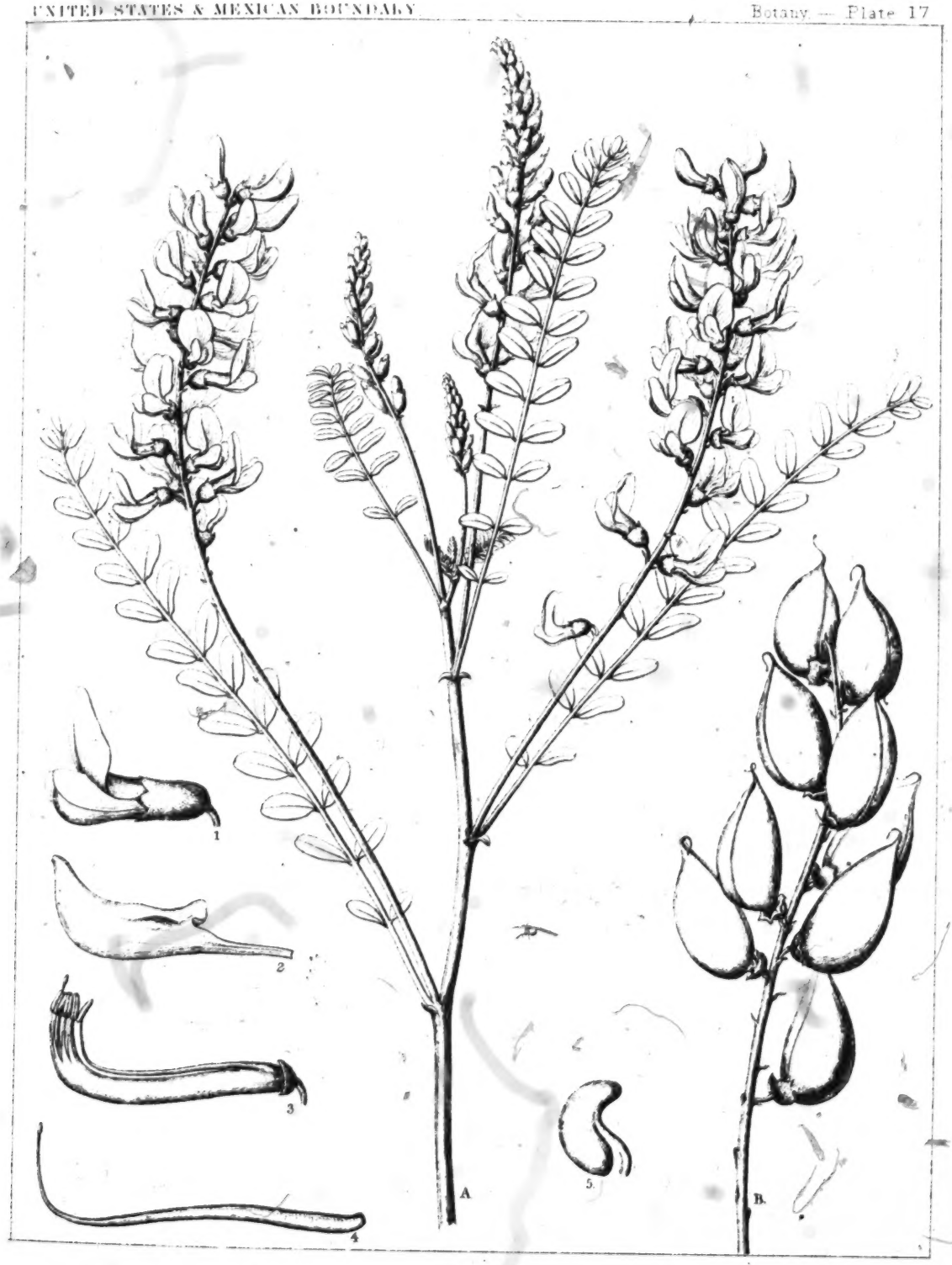

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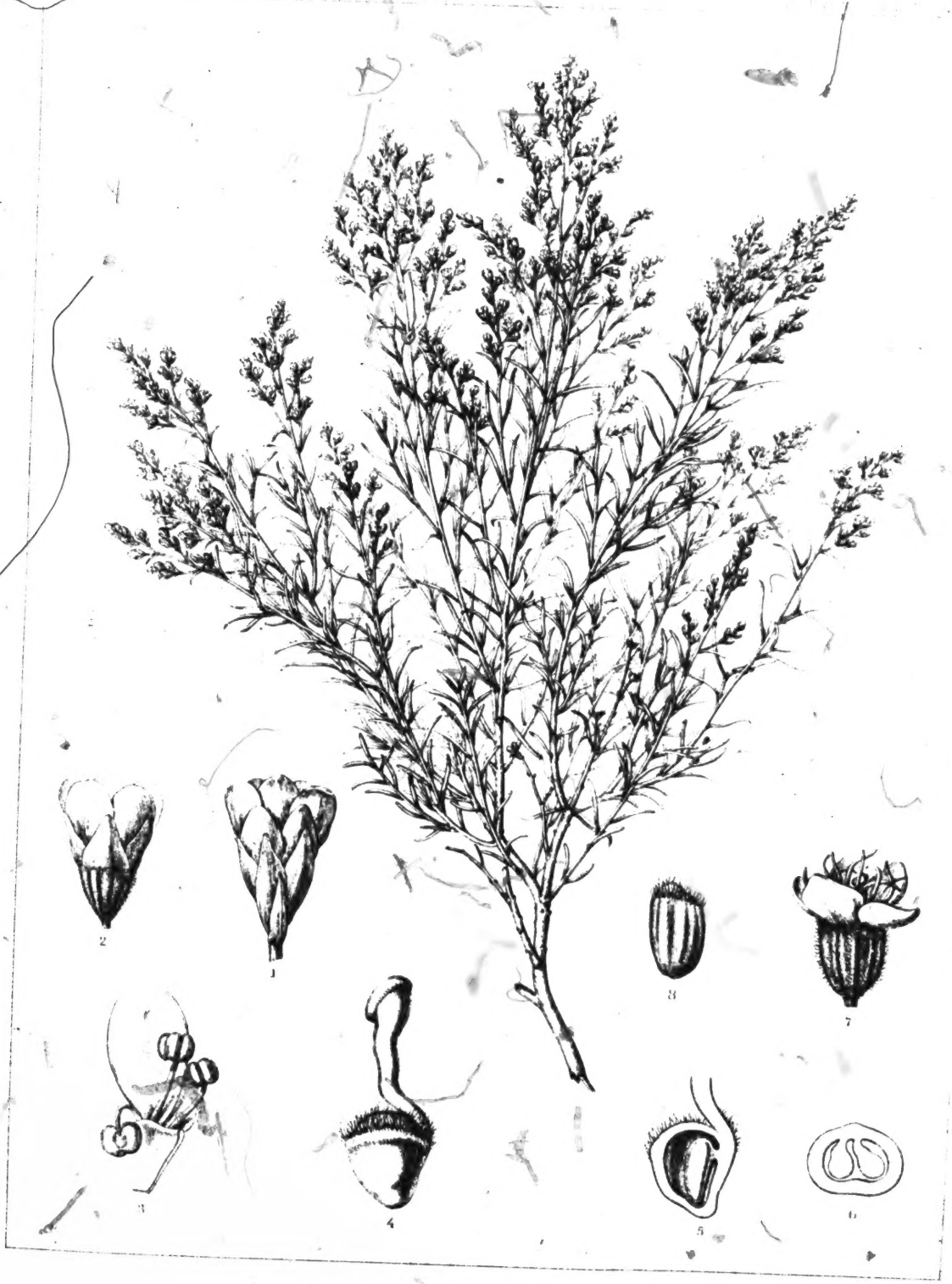
CHÆTOCALYX SCHOTTII C. WISLIZENI

UNITED STATES & MEXICAN BOUNDARY

ACAENA PINNATIFIDA



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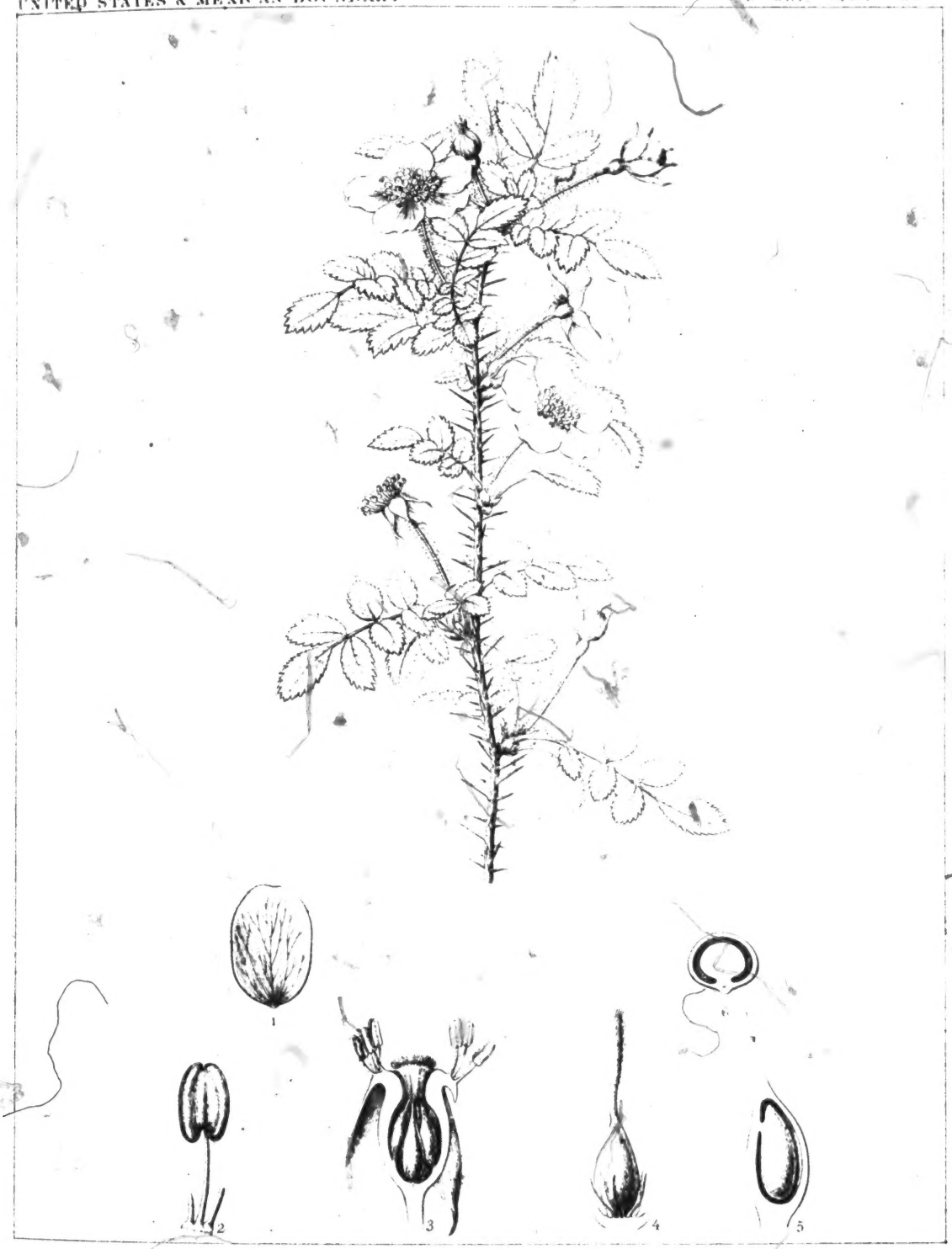

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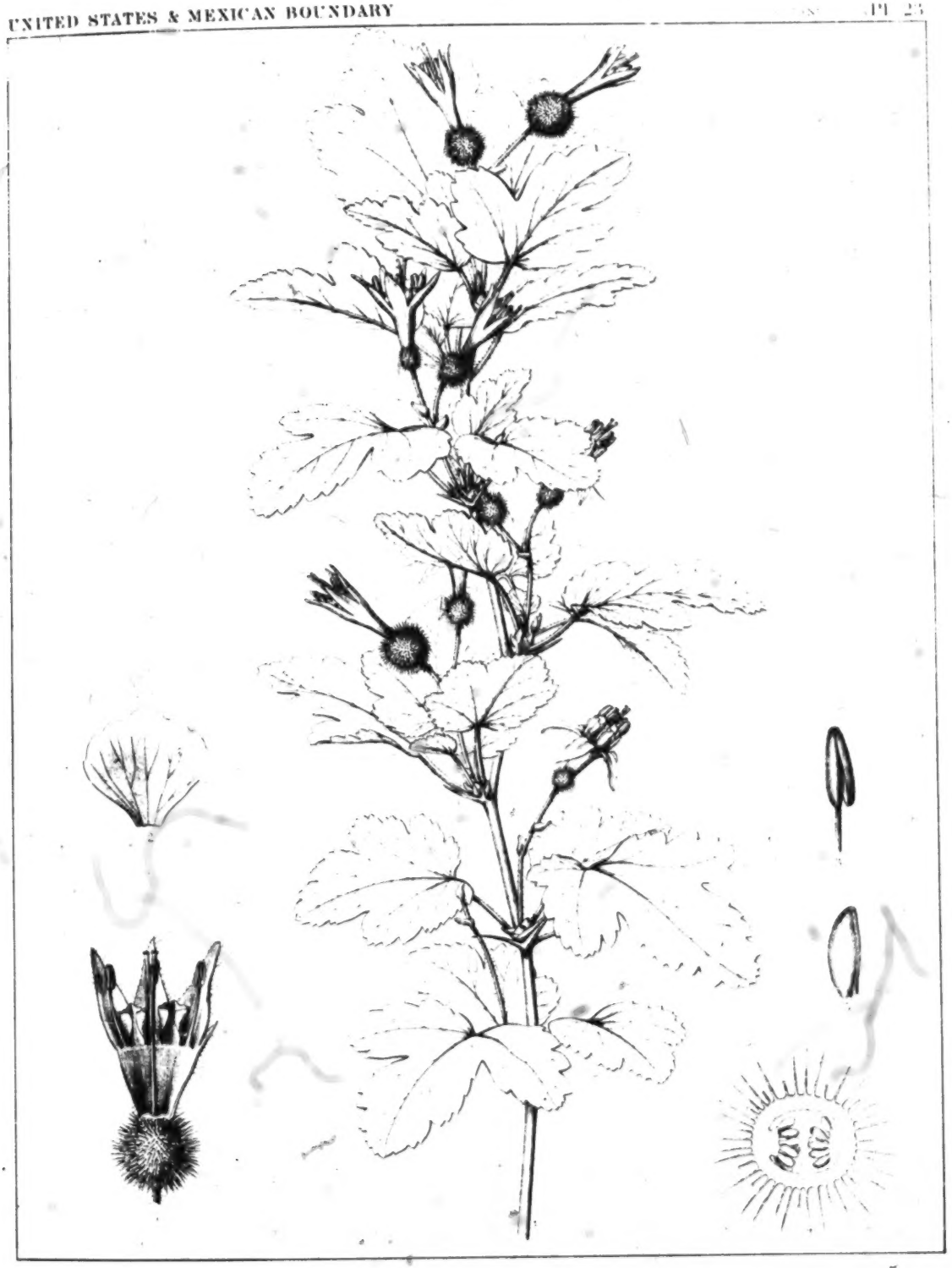

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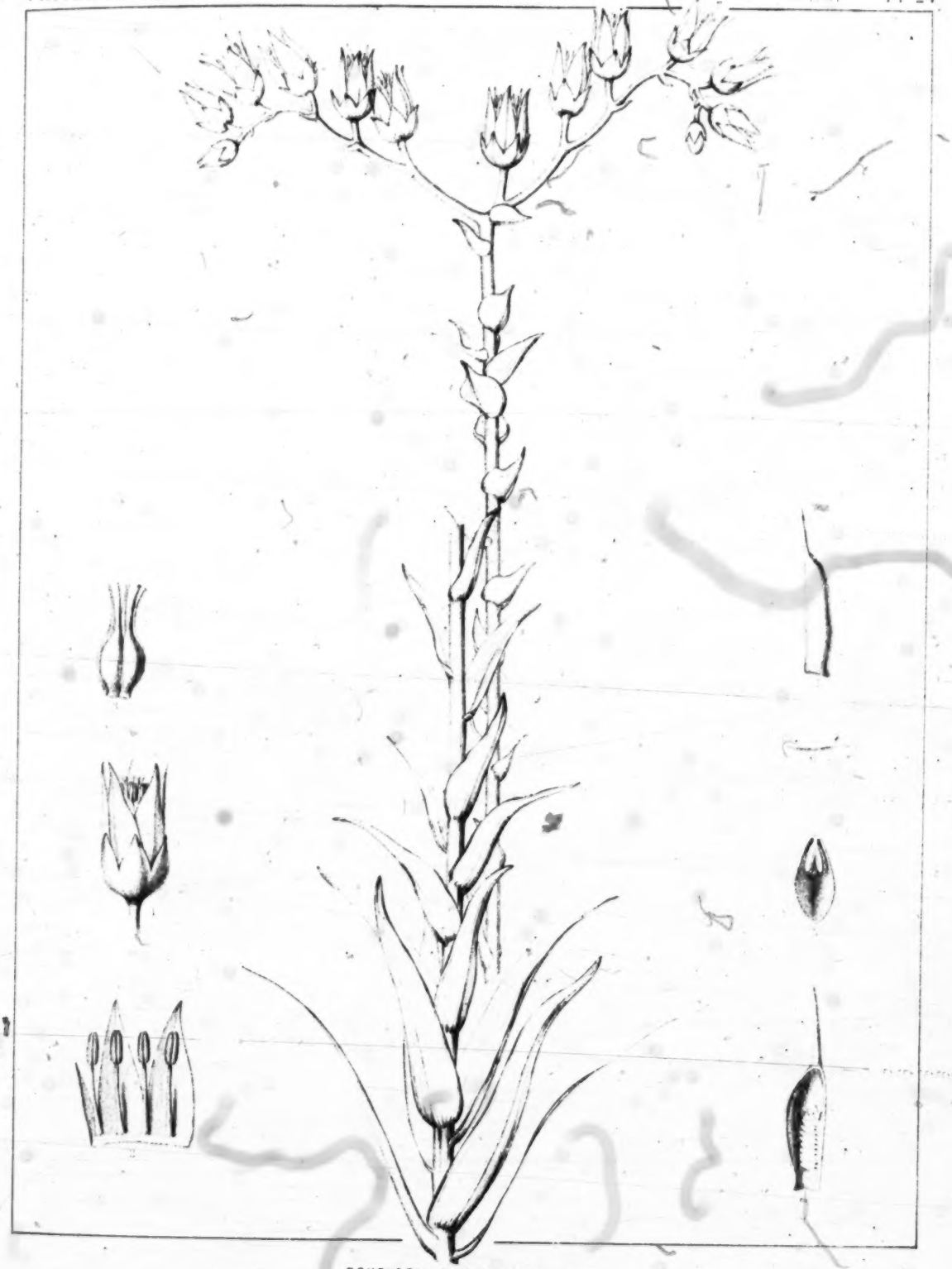

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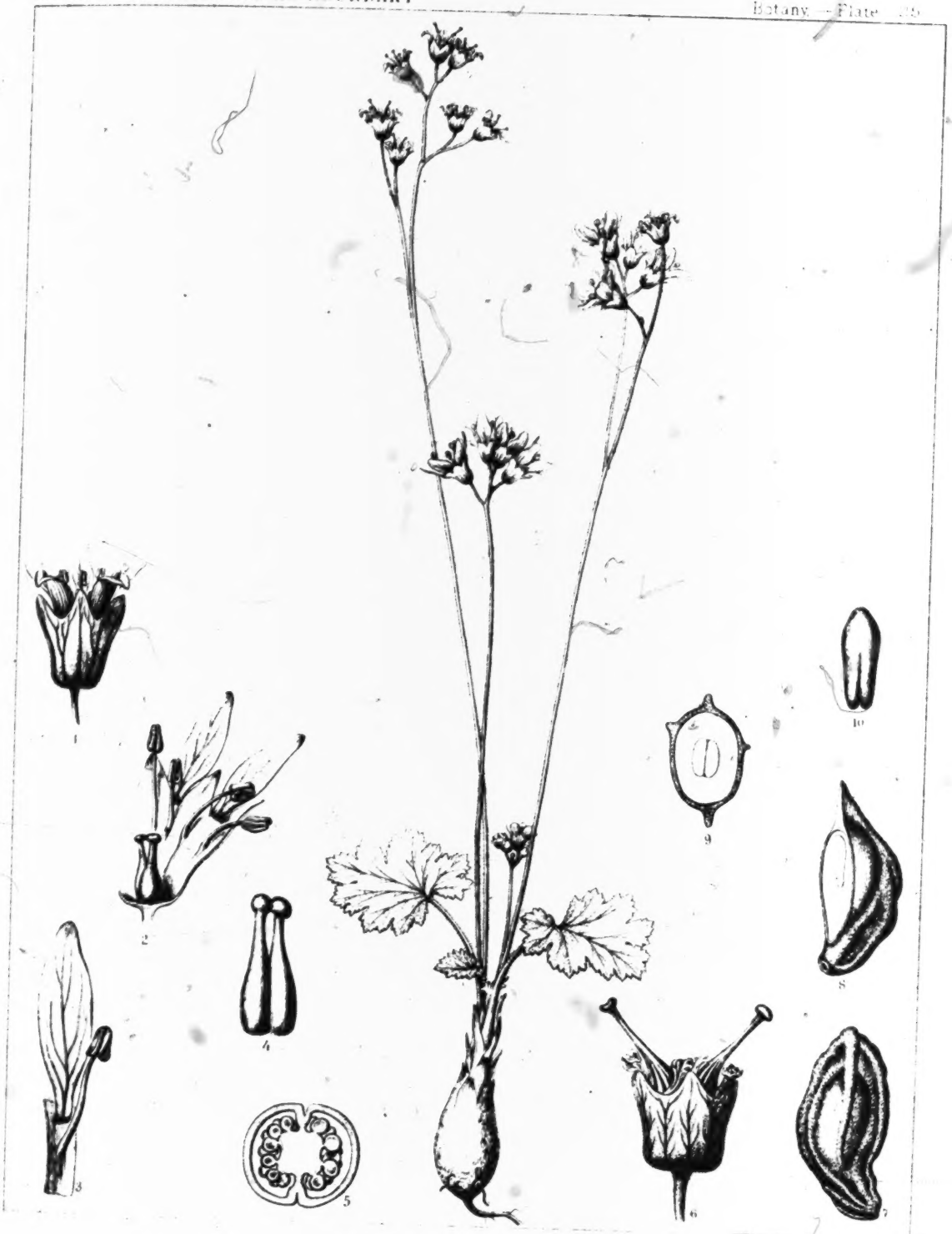

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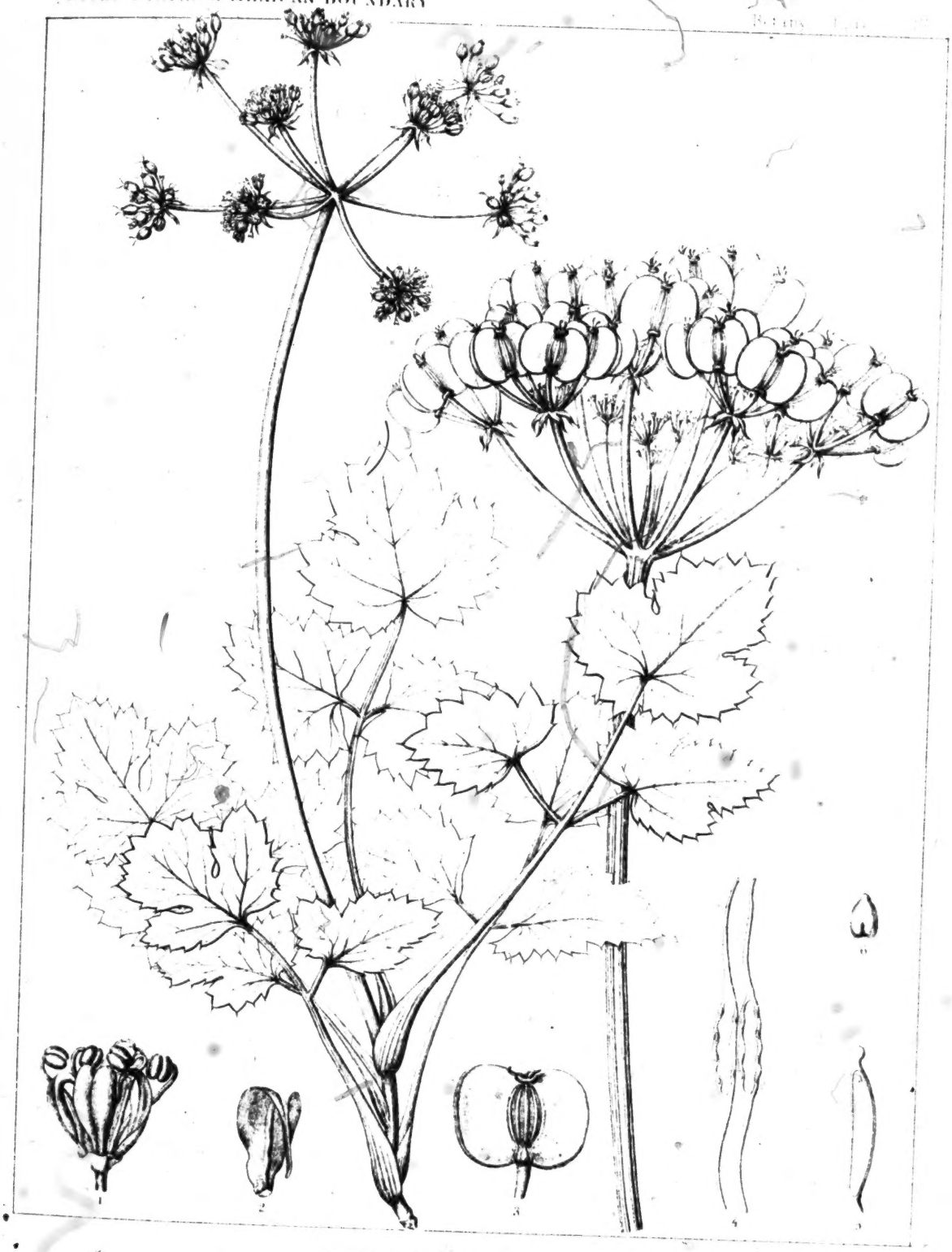

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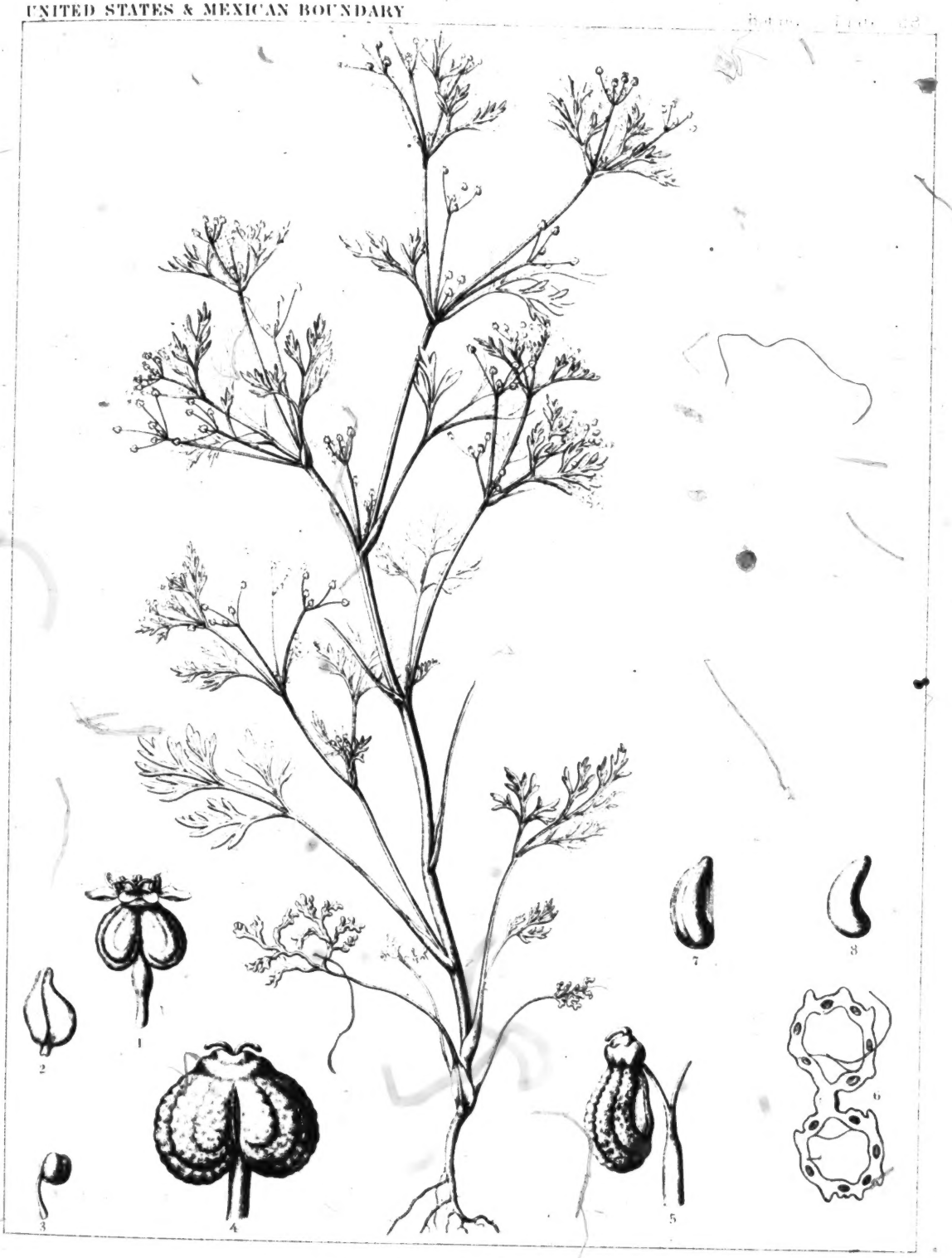

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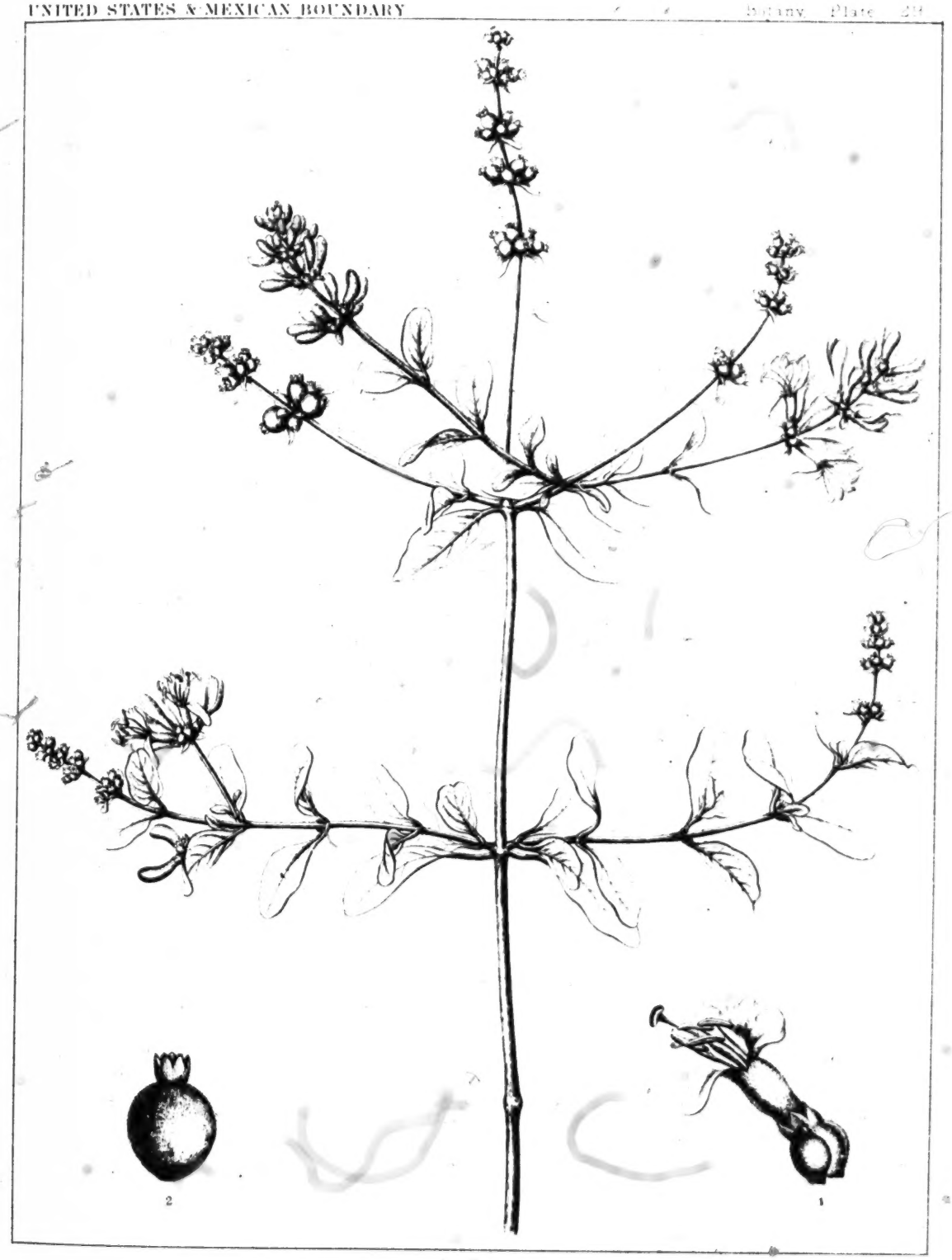

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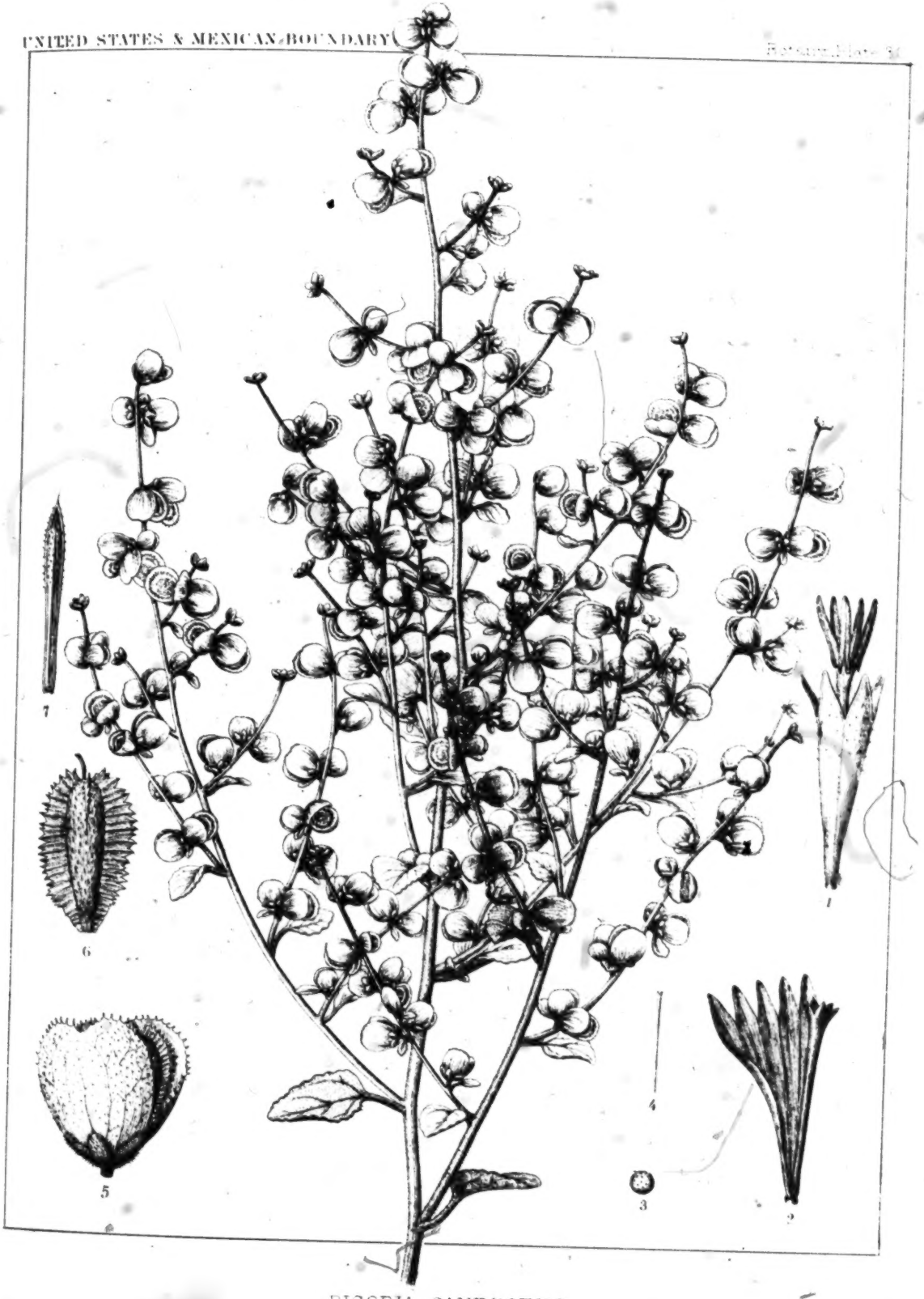

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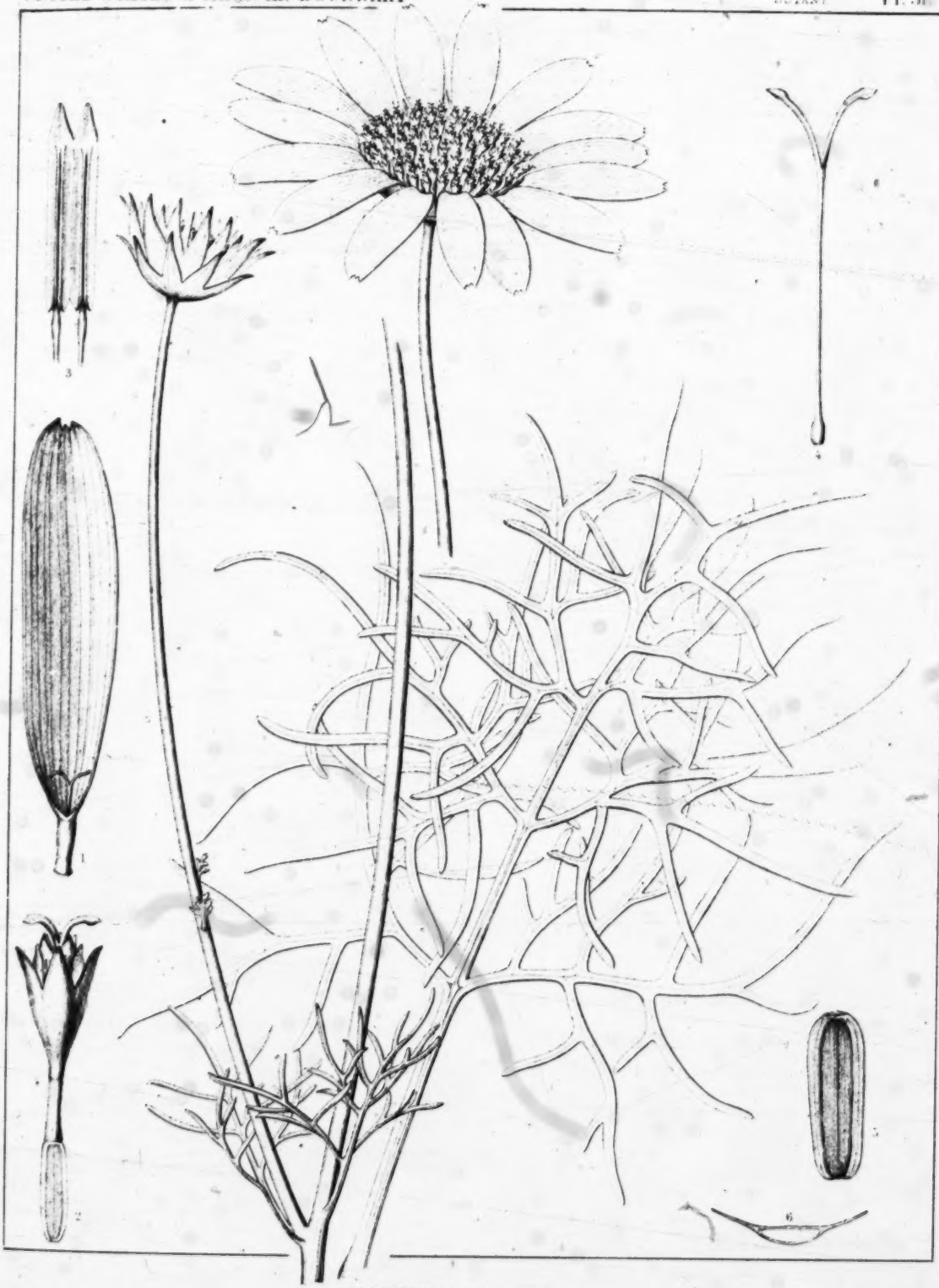

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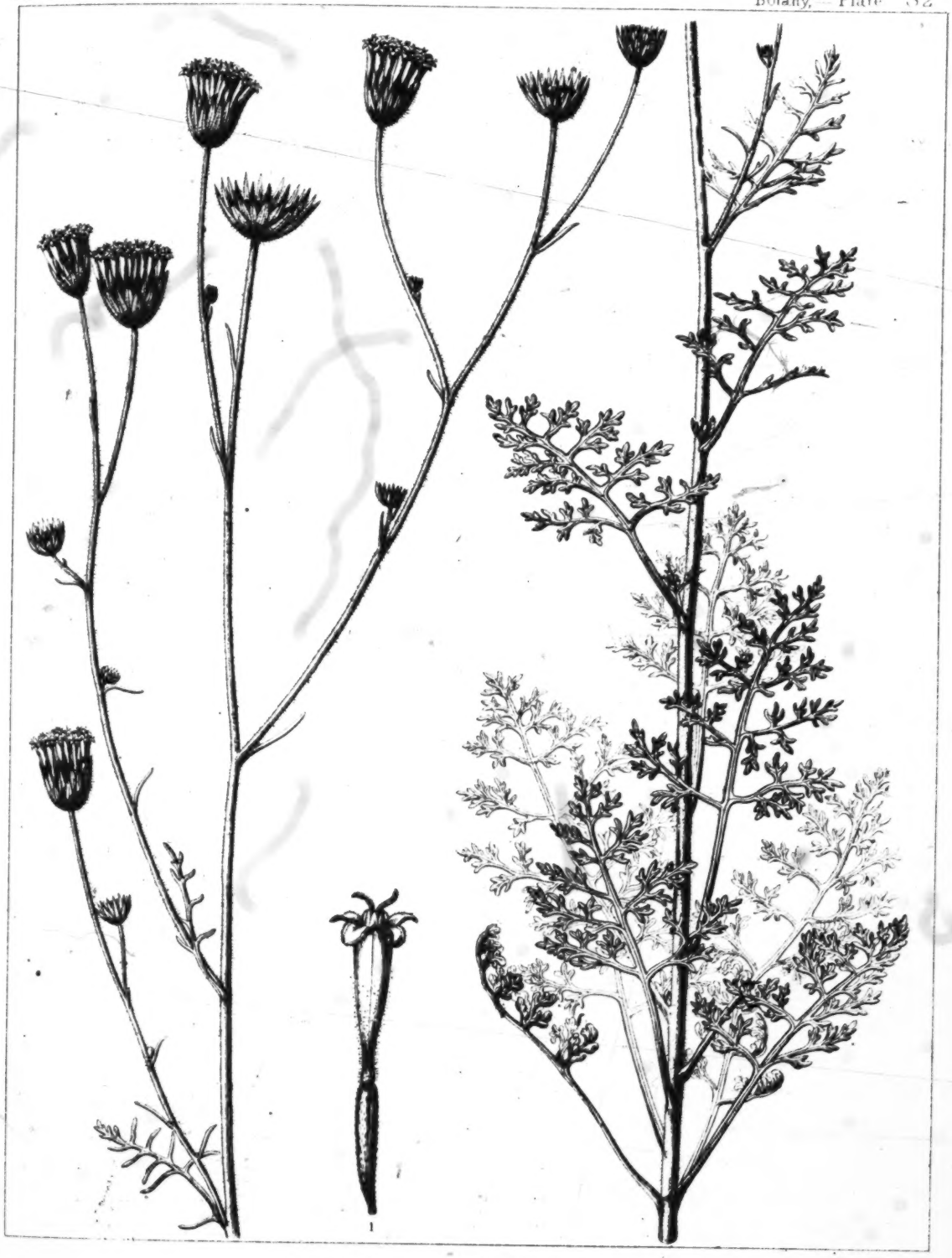

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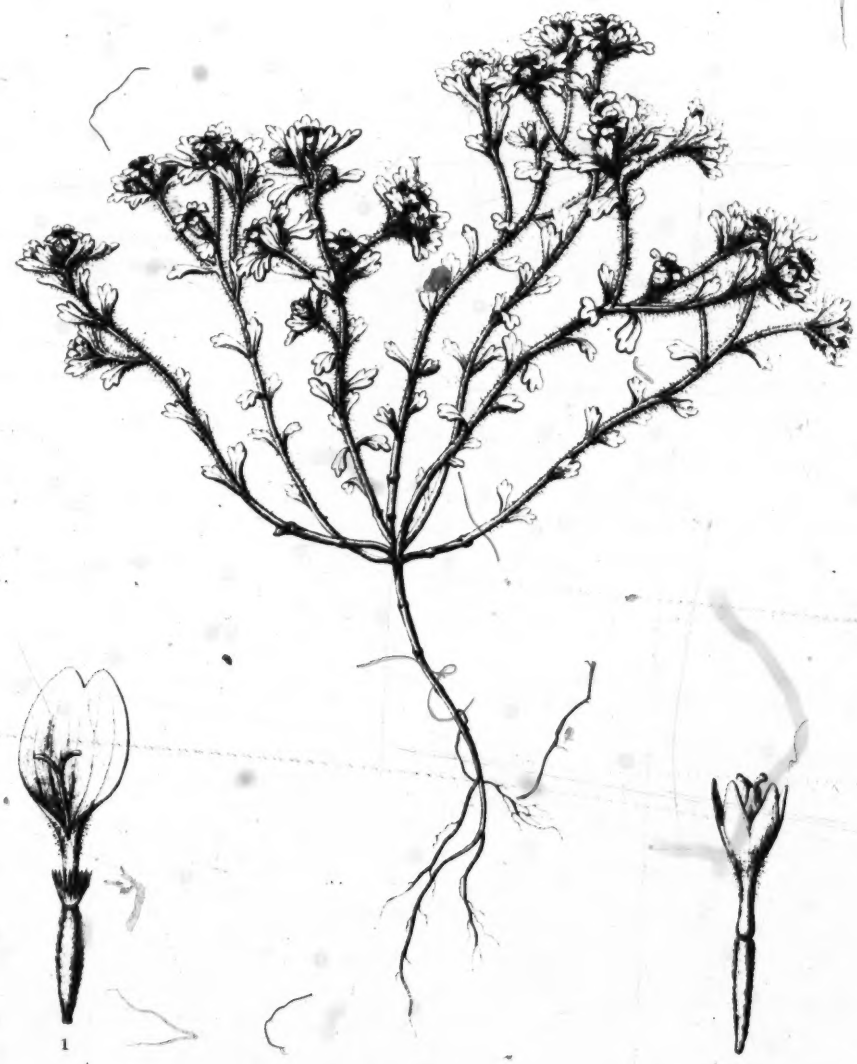
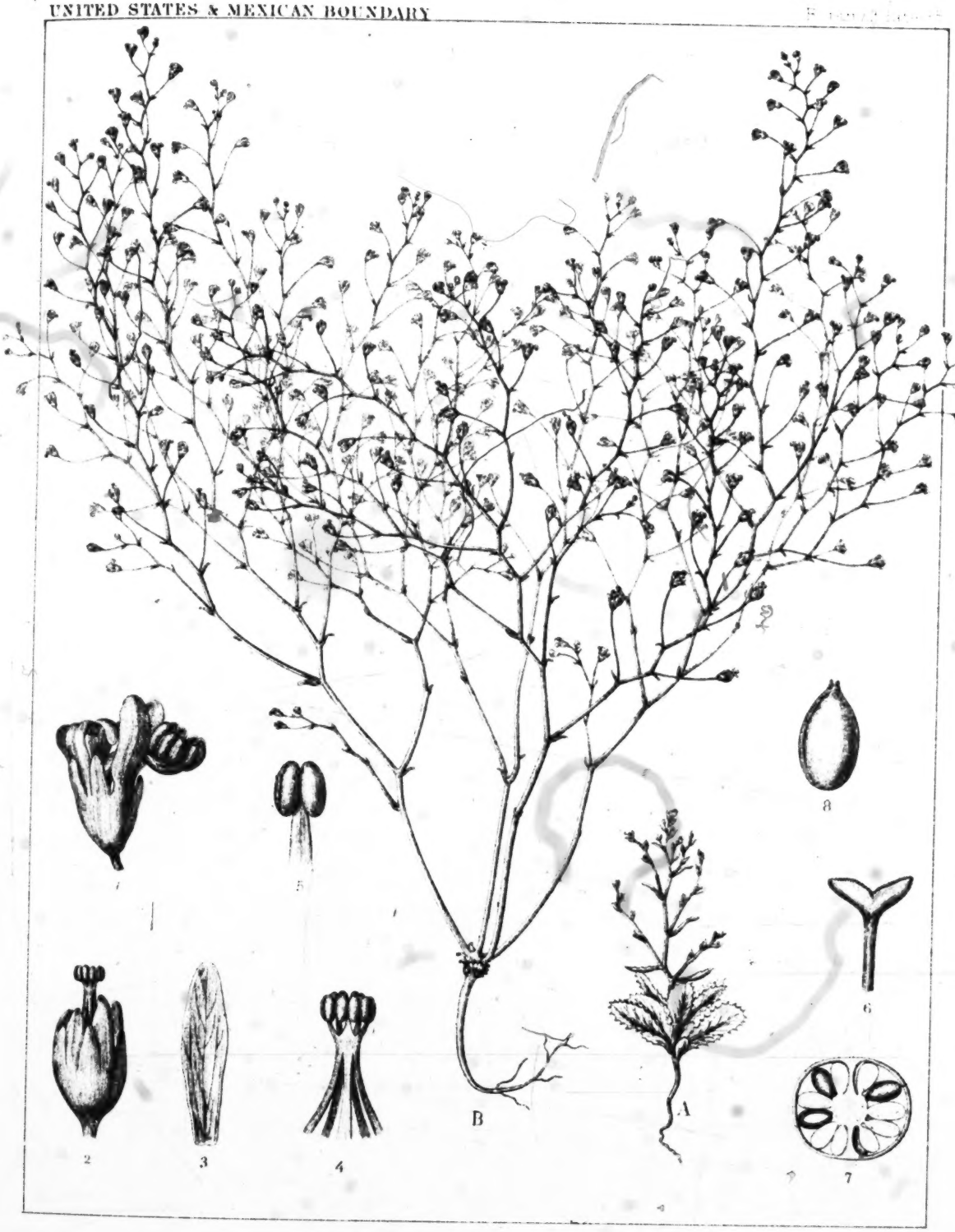


1

2

ACTINOLEPIS MULTICAULIS

RAFINÉSQUIA CALIFORNICA



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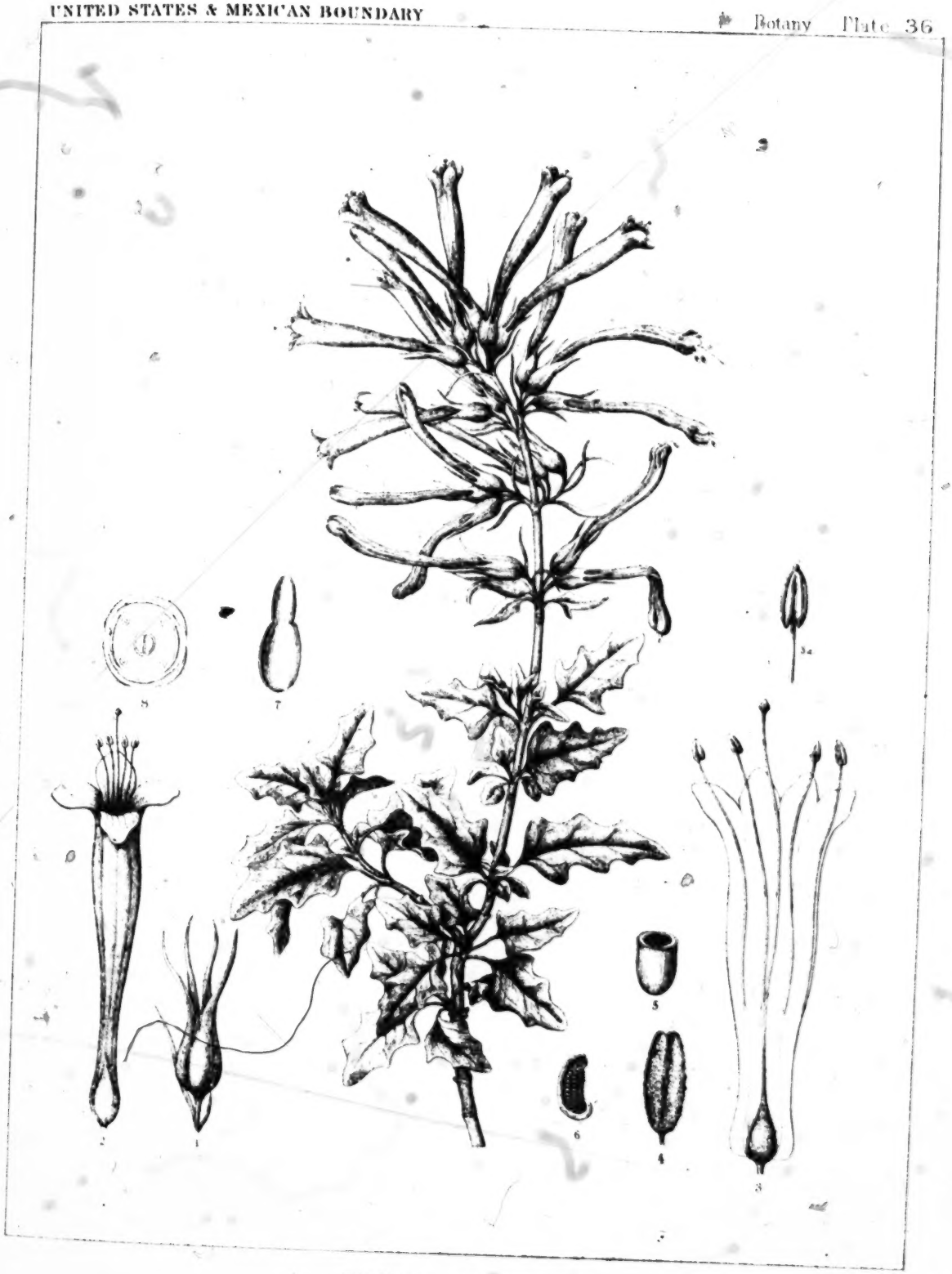

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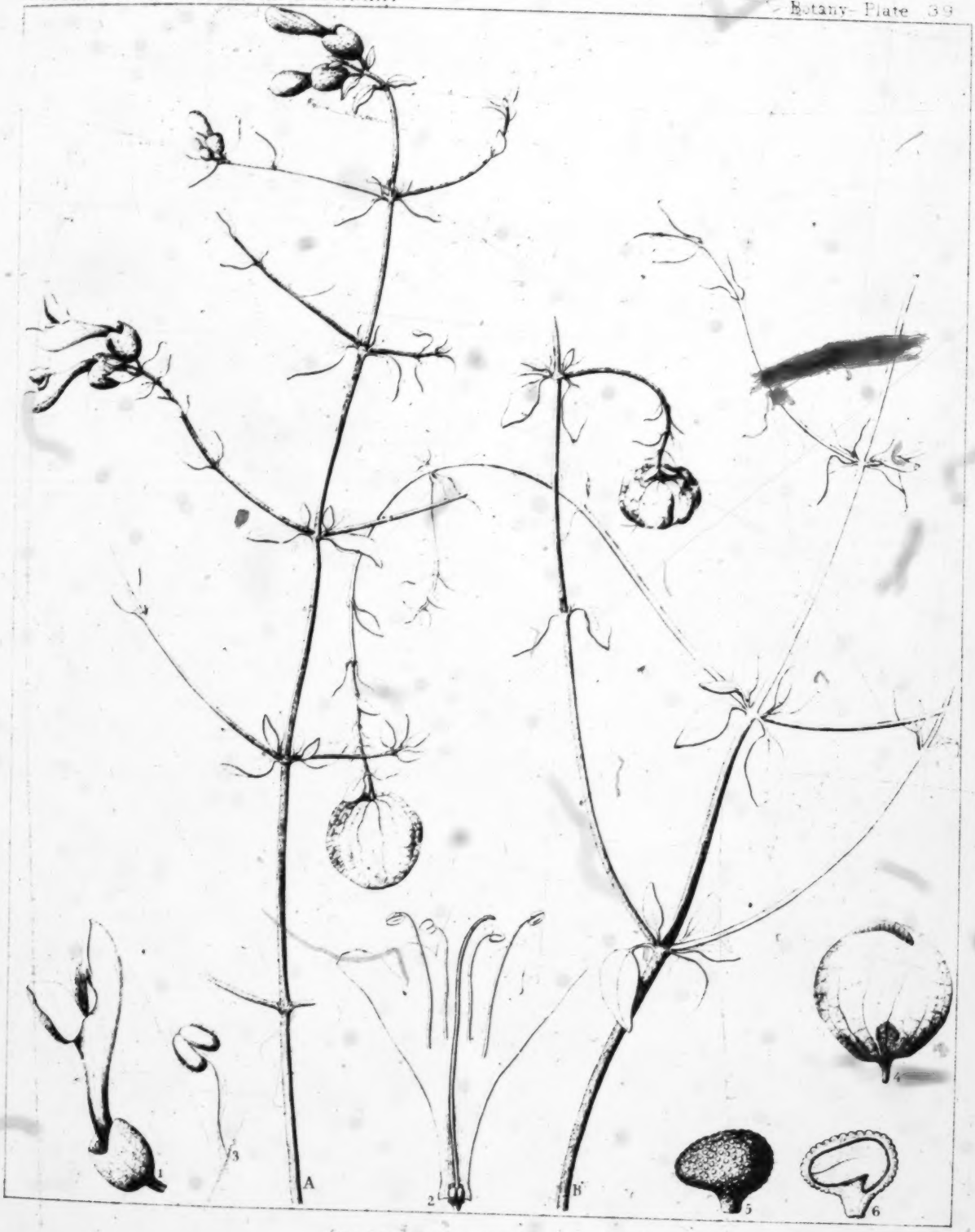

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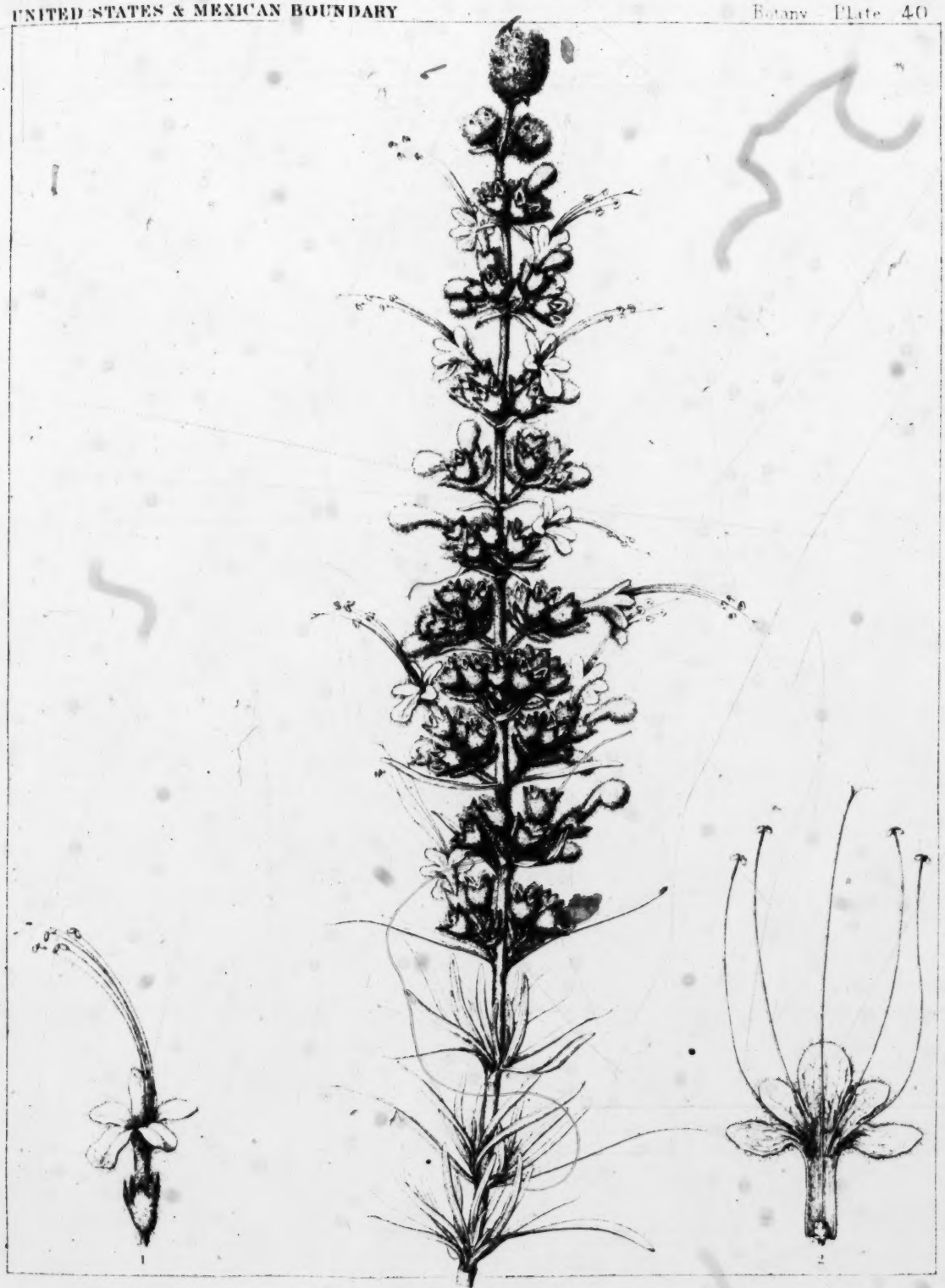

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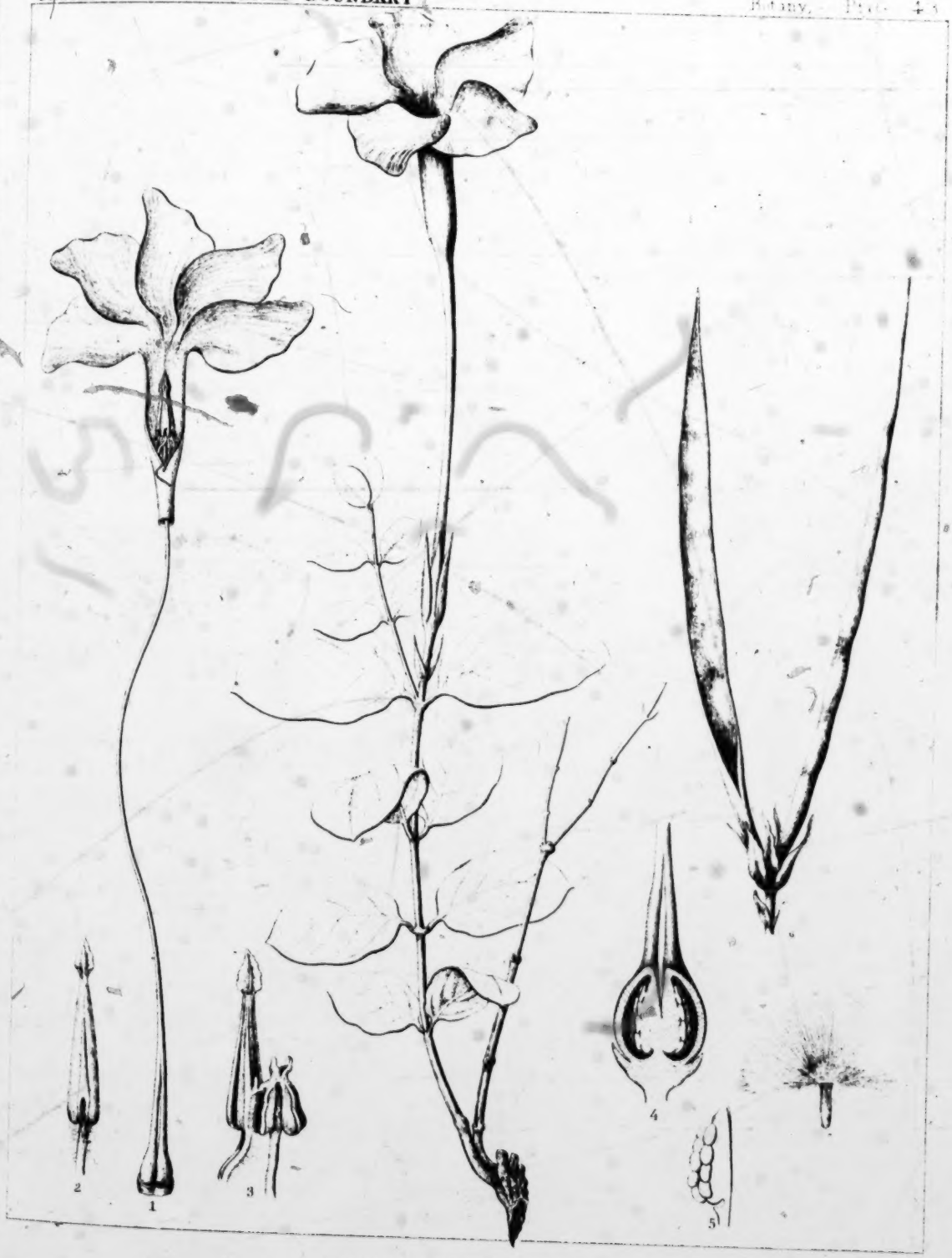

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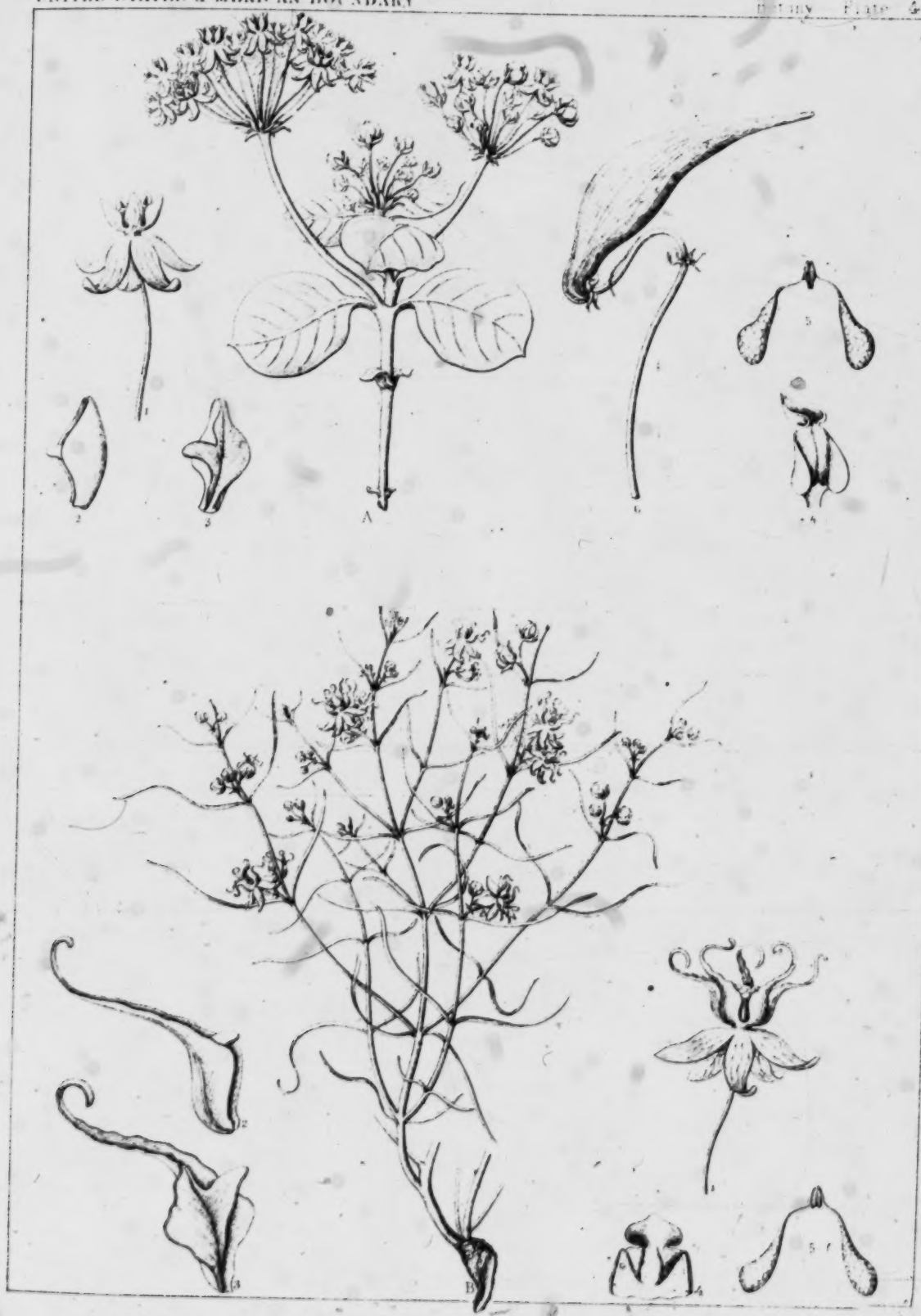

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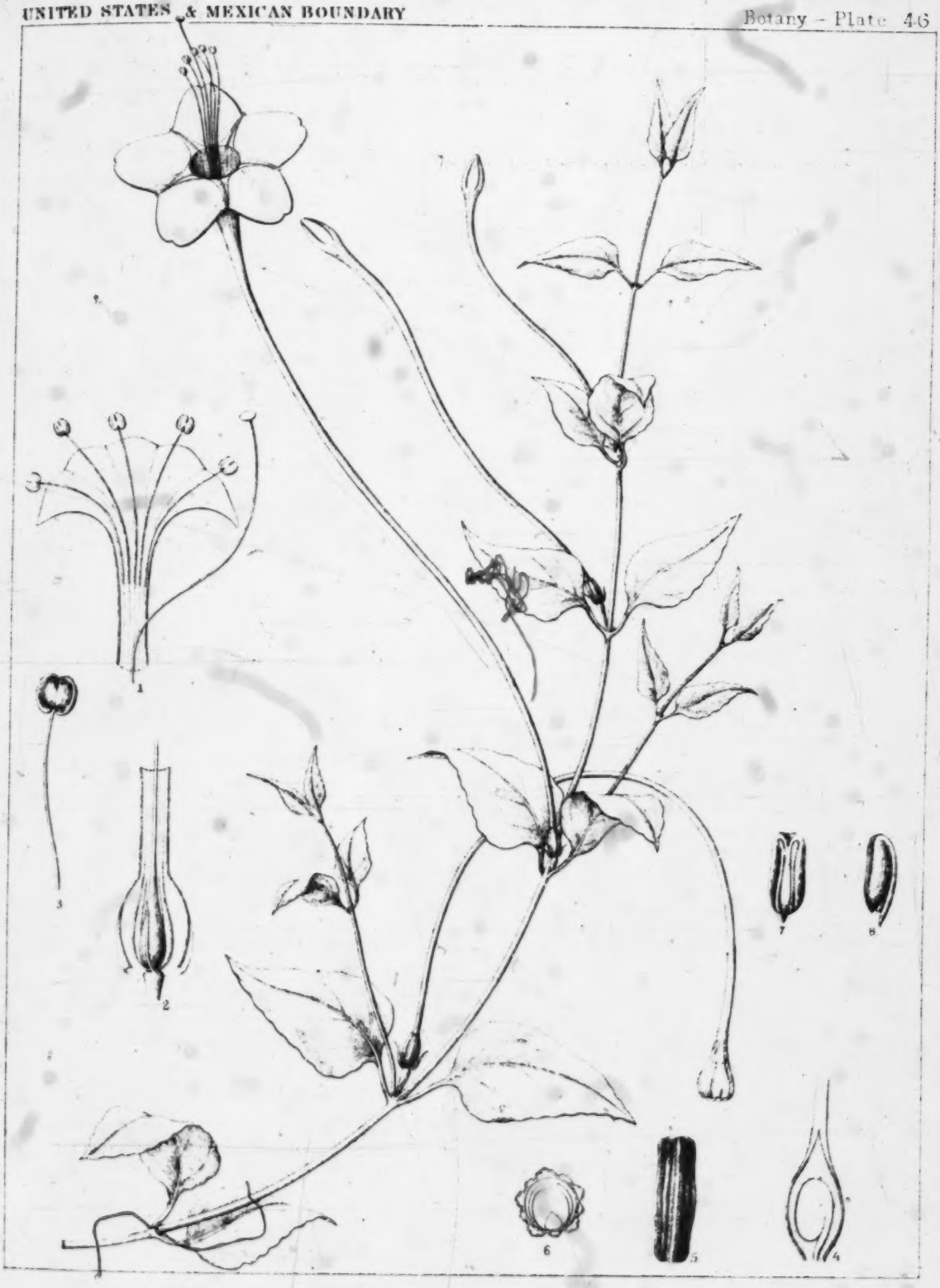
B. ASCLEPIAS MACROTIS



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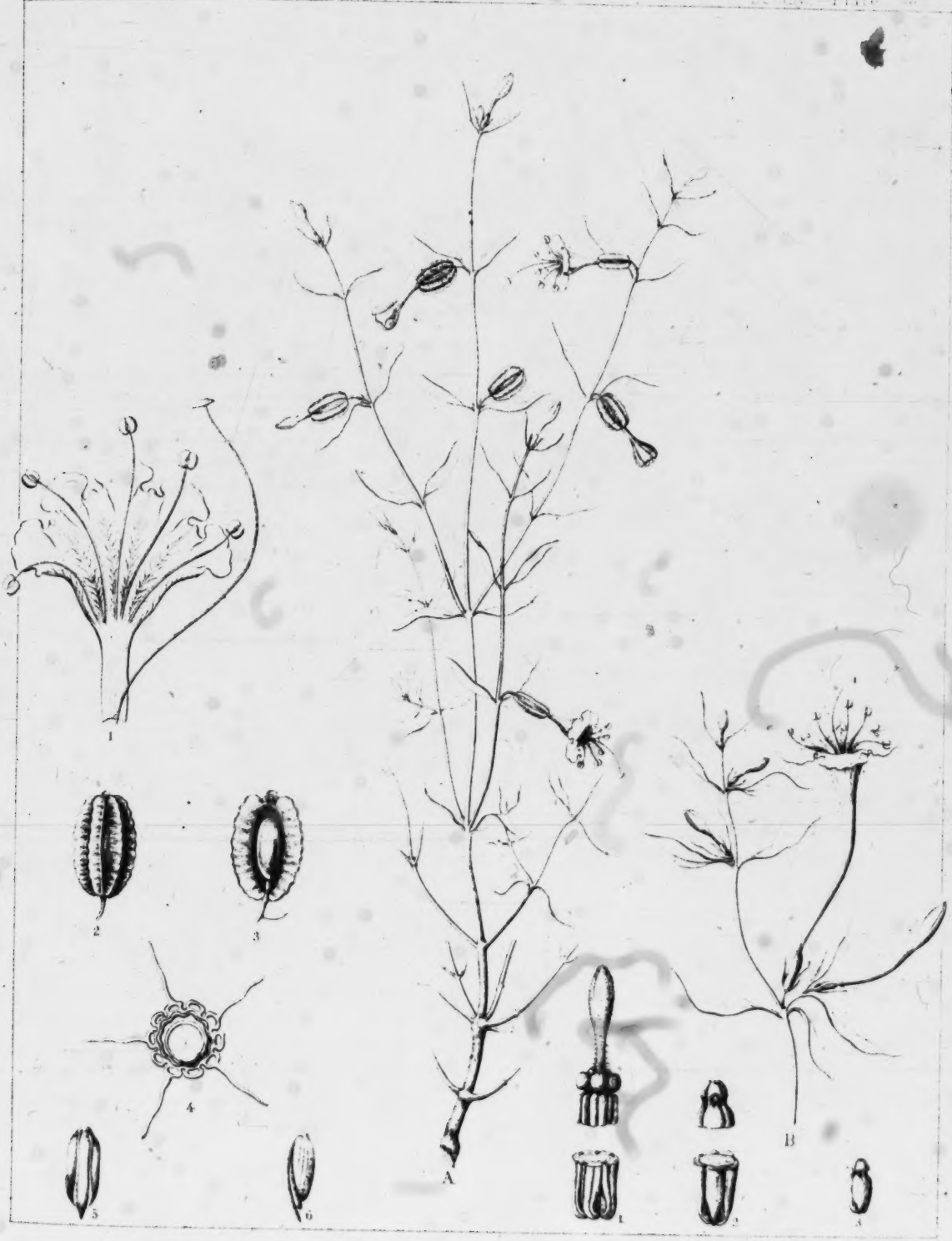

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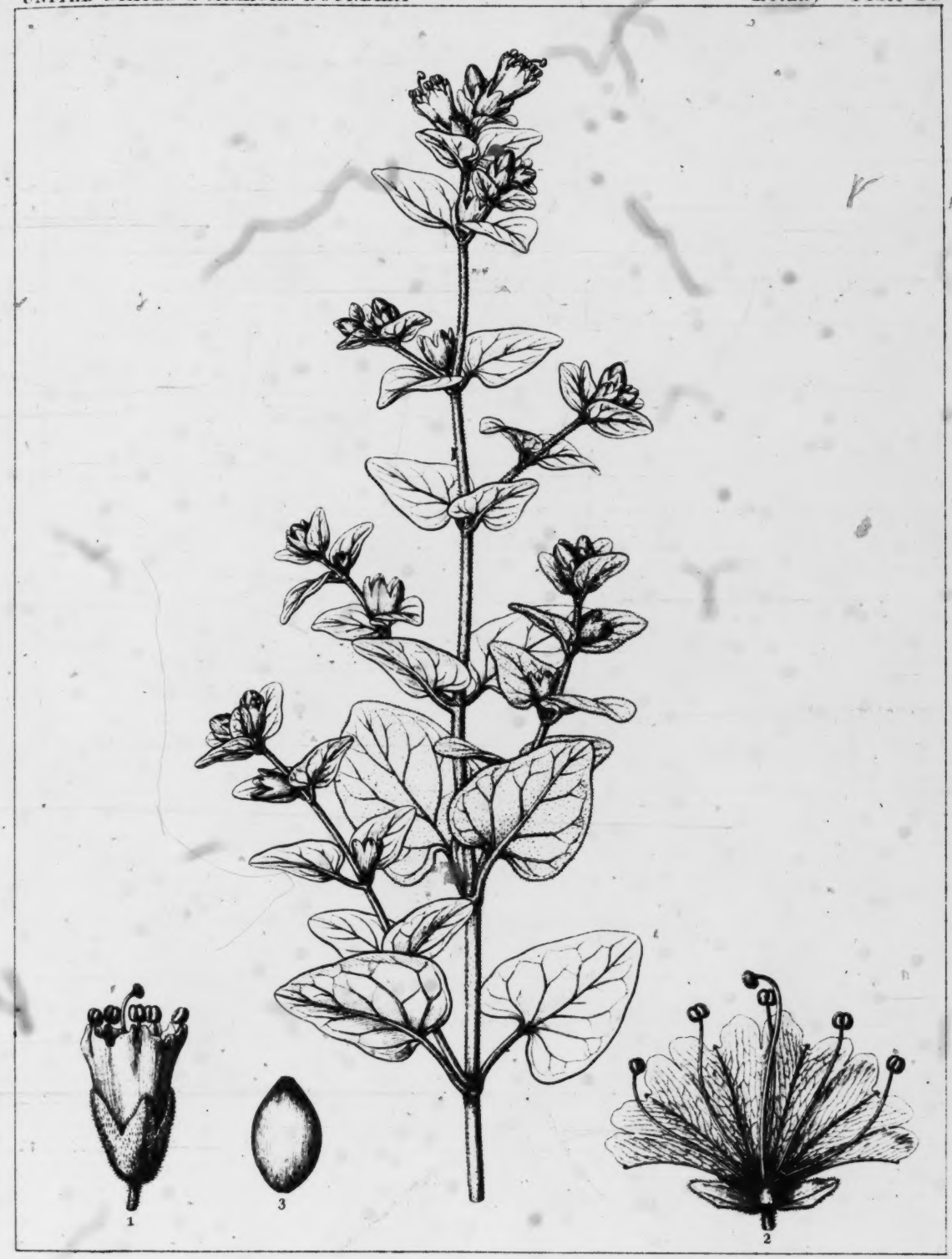

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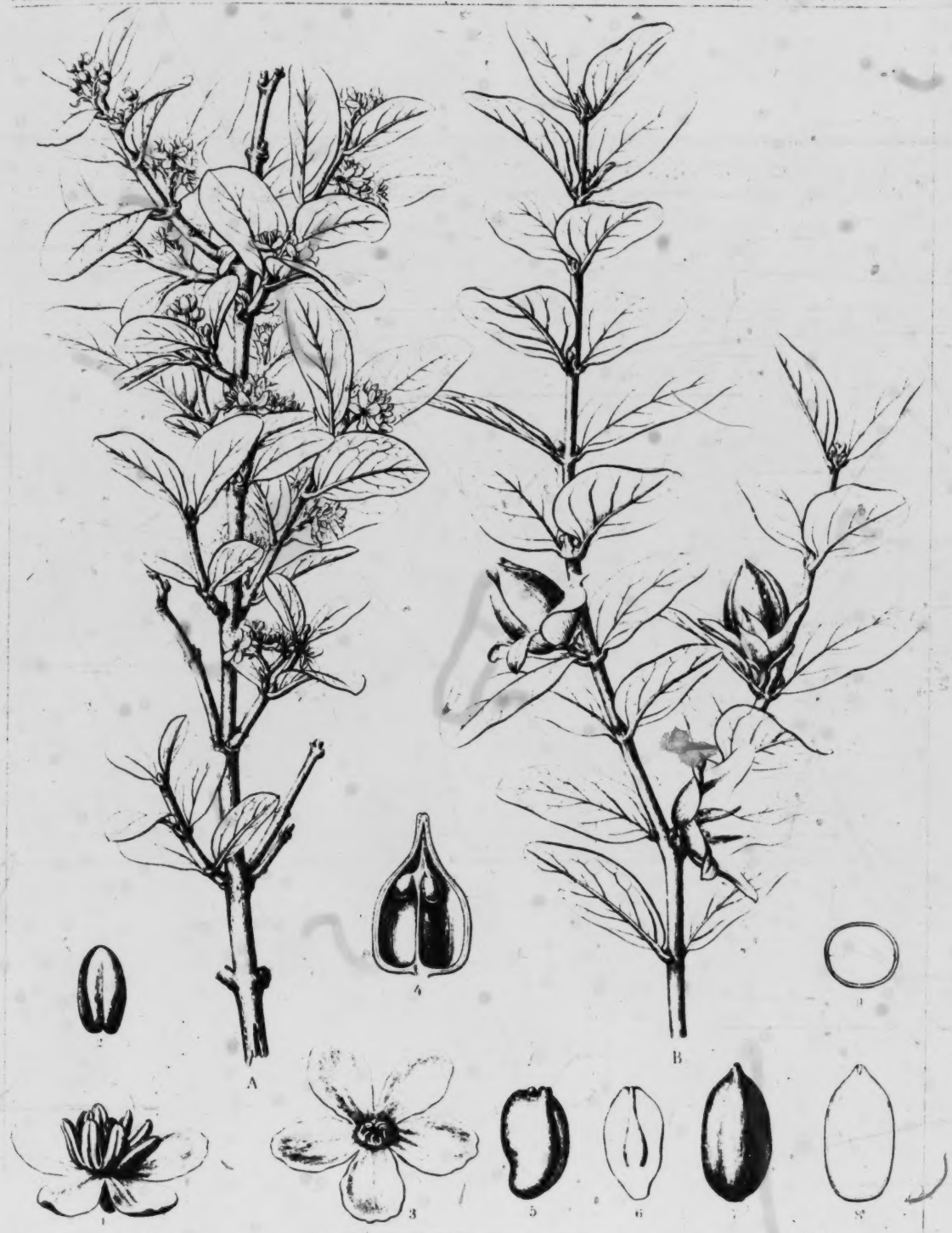

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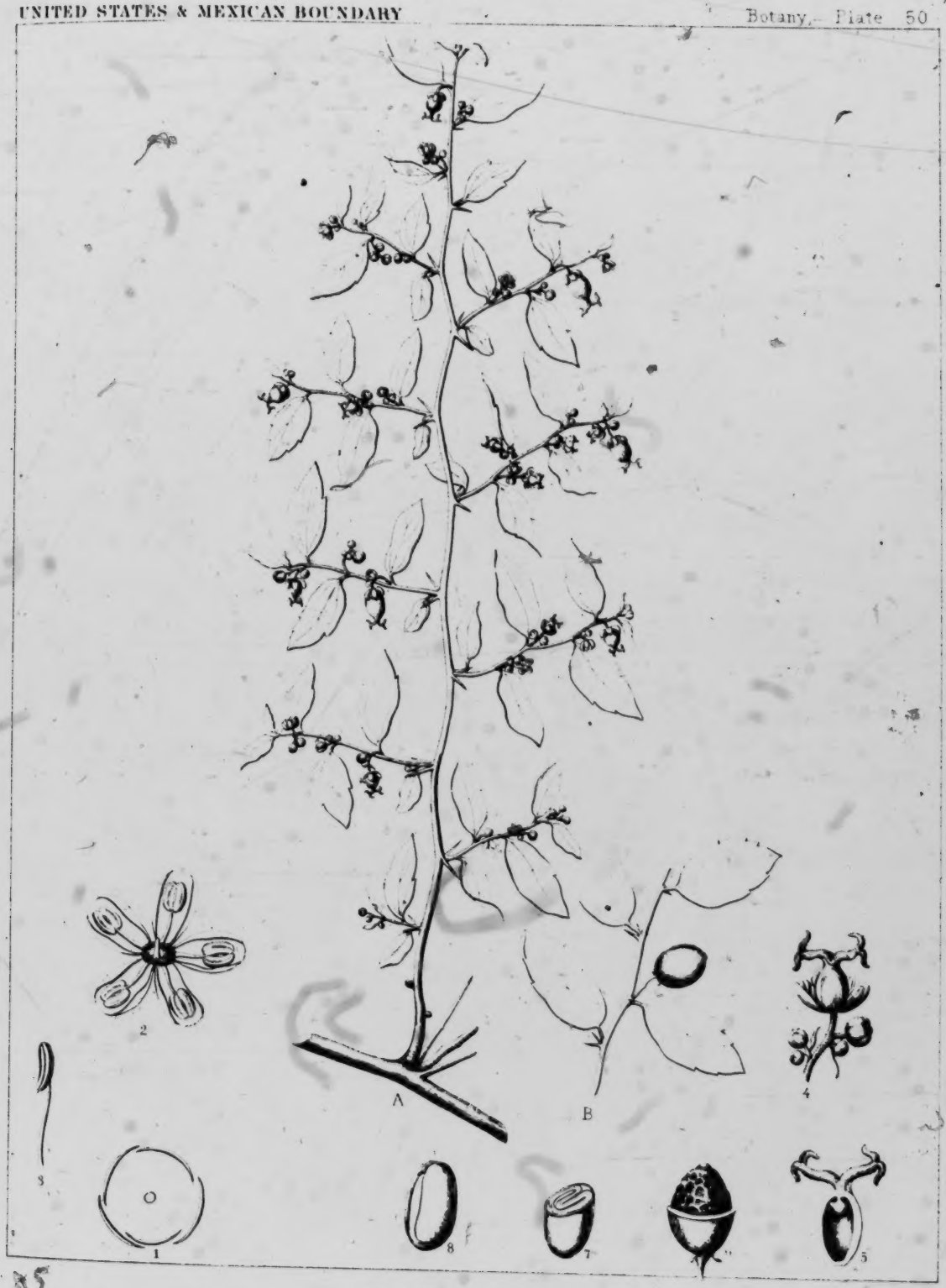

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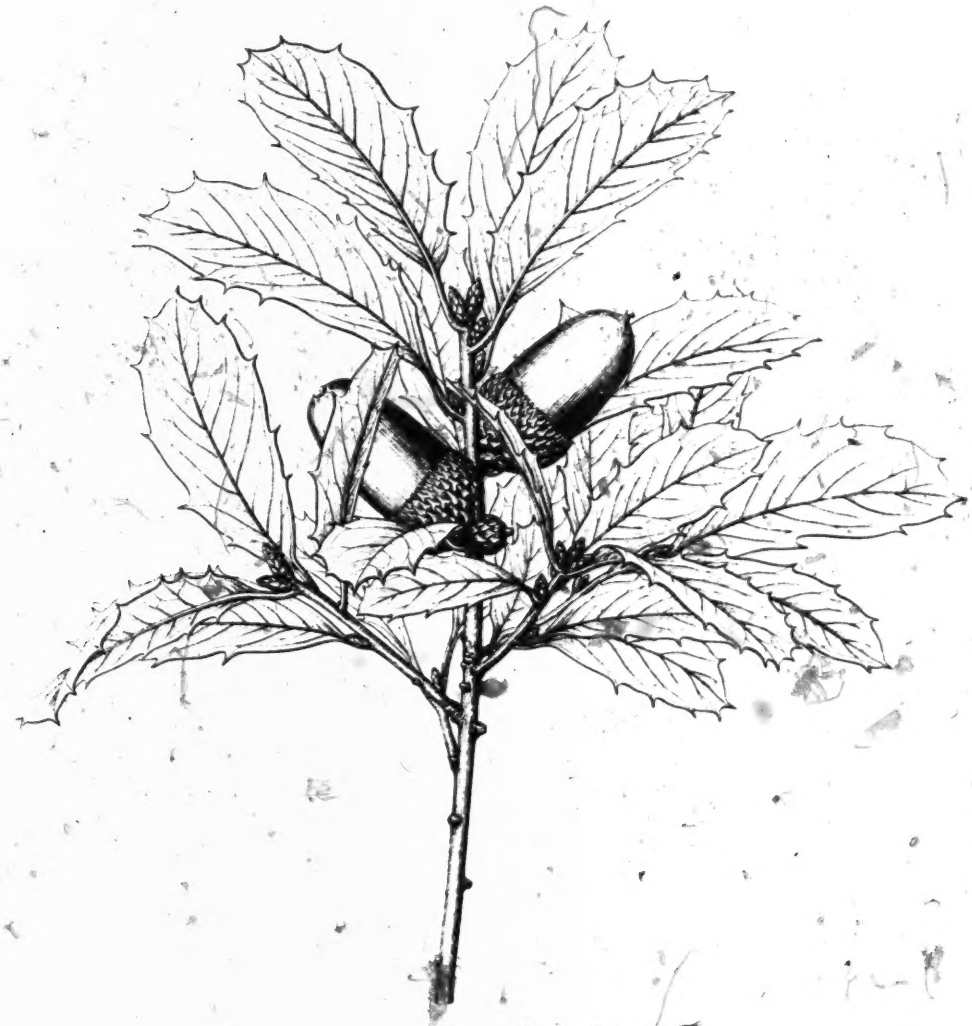

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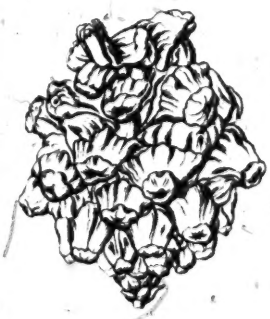
PILOSTYLES THURBERI.



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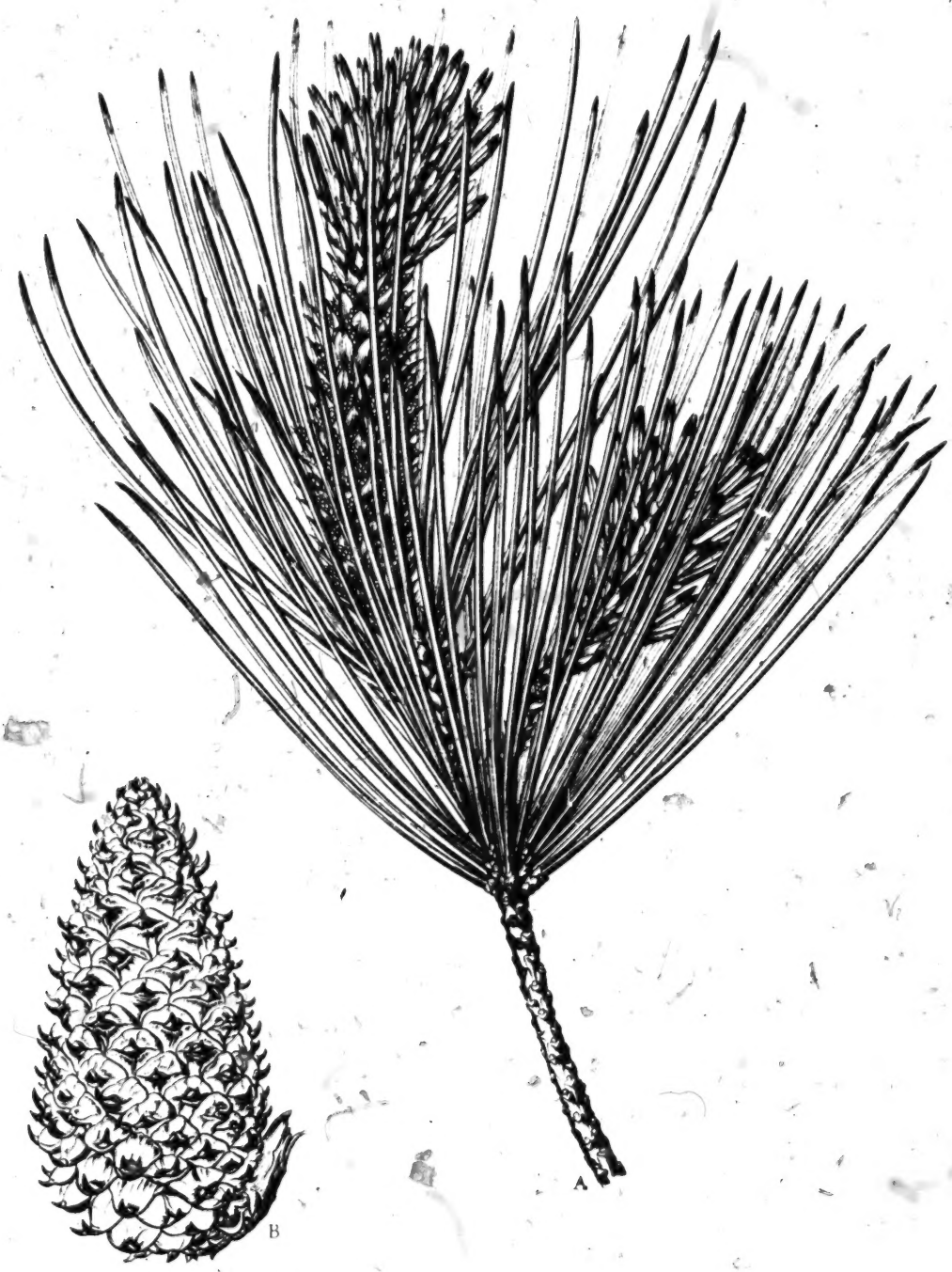

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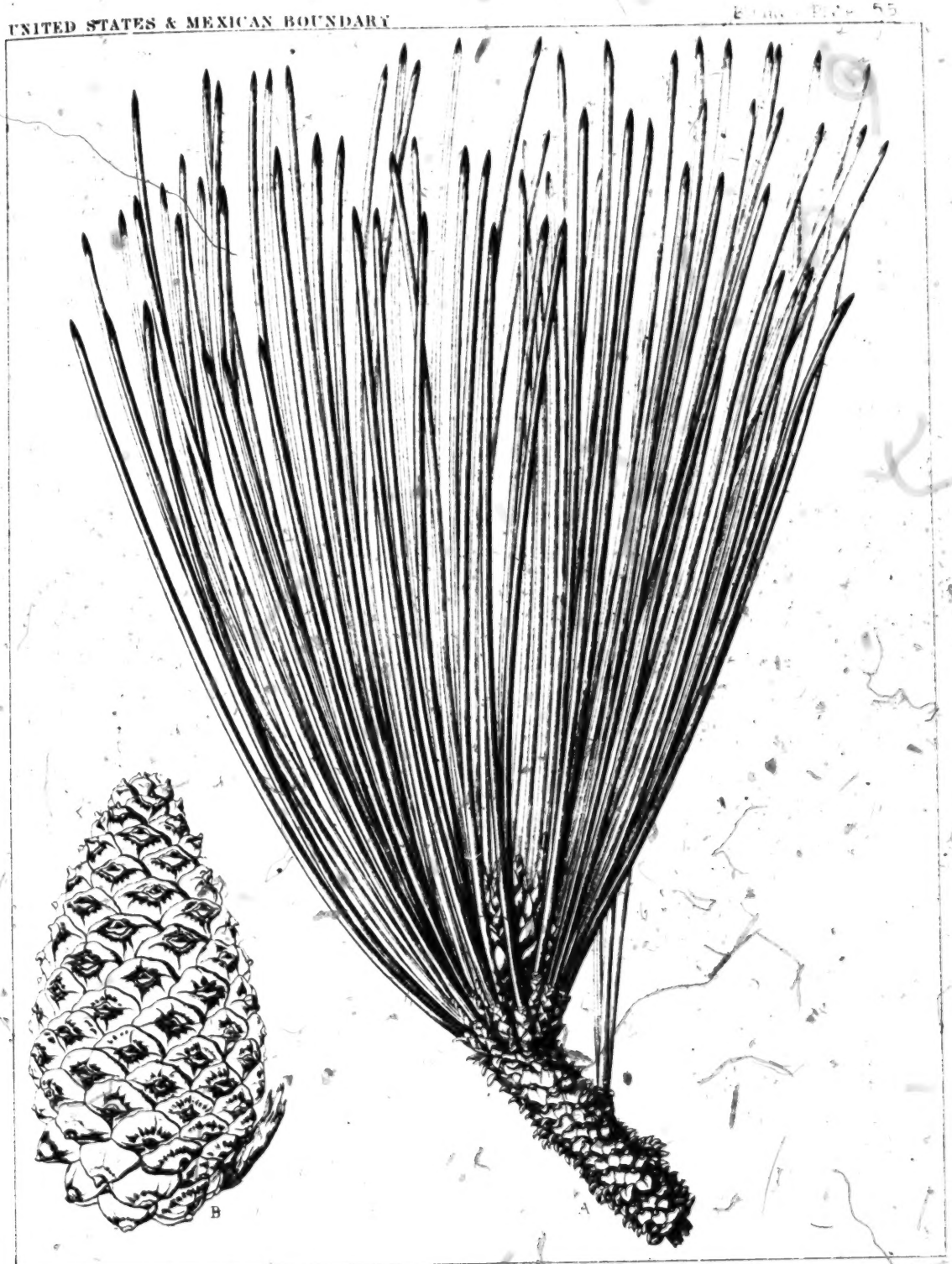
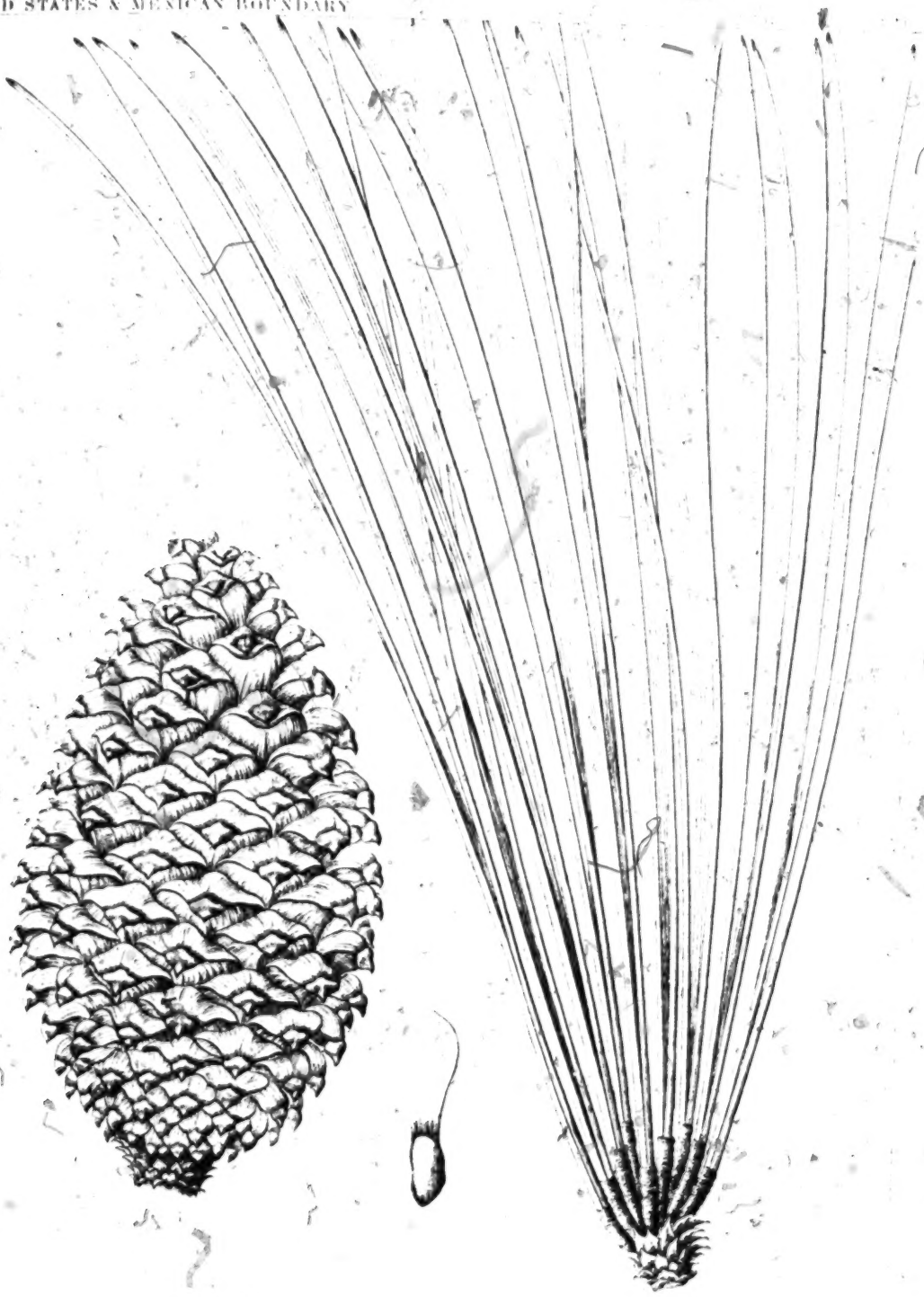
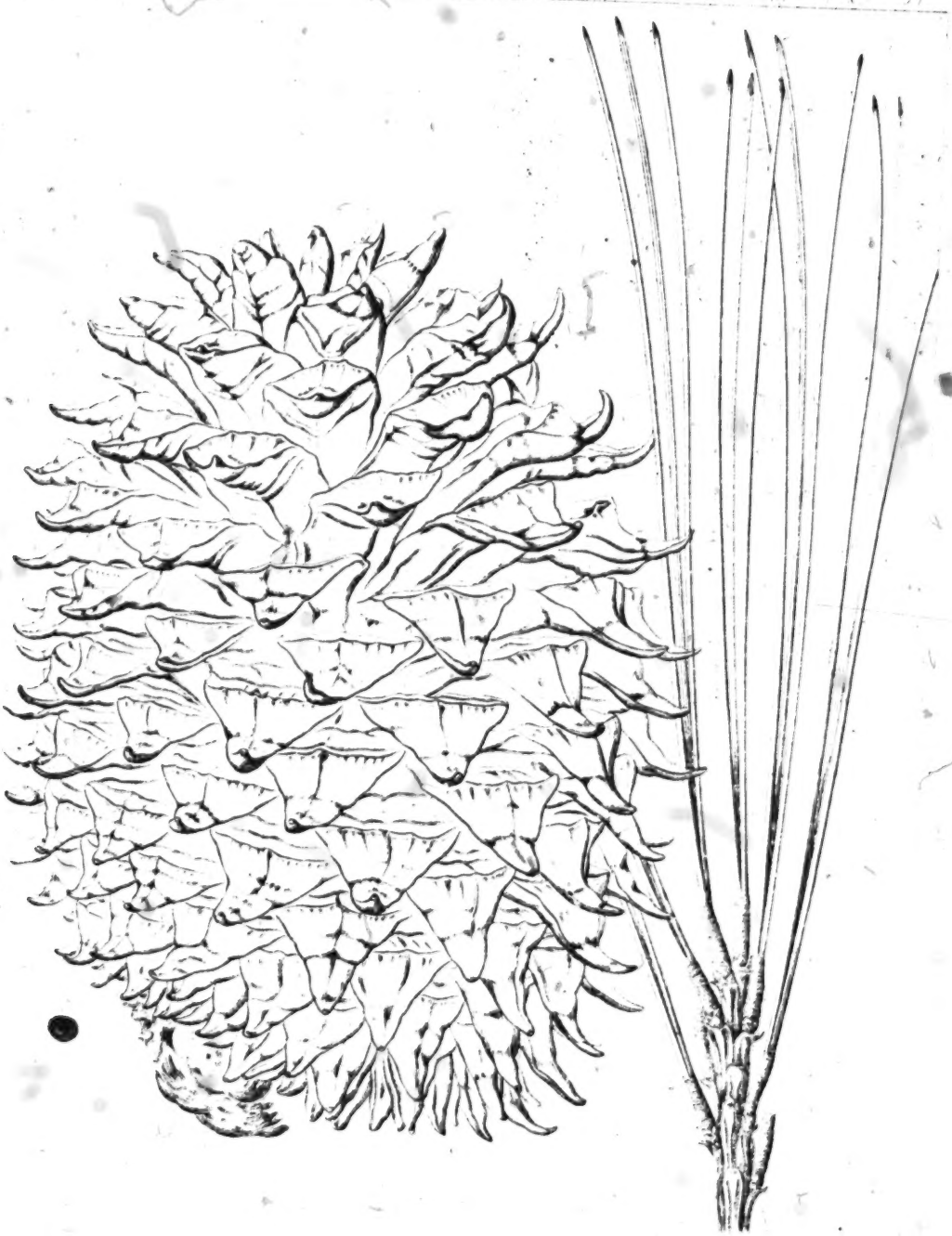
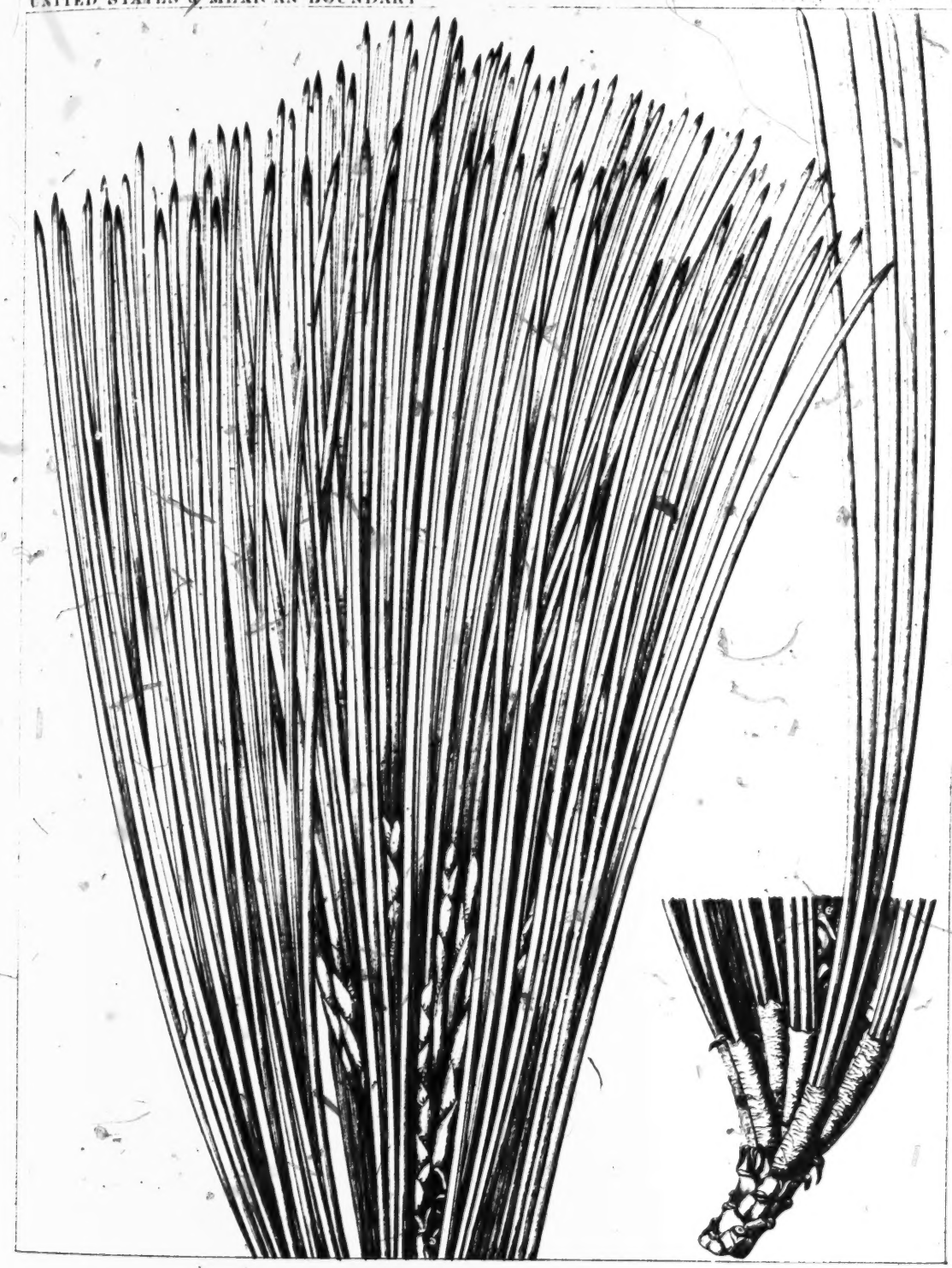


PINUS INSIGNIS





PINUS SABINIANA



PINUS TORREYANA

UNITED STATES & MEXICAN BOUNDARY

CHLOROGALUM POMERIDIANUM

FRITILLARIA LANCEOLATA

UNITED STATES AND MEXICAN

BOUNDARY SURVEY,

UNDER THE ORDER OF

LIEUT. COL. W. H. EMORY,

MAJOR FIRST CAVALRY, AND UNITED STATES COMMISSIONER.

CACTACEÆ

OF THE BOUNDARY,

BY

GEORGE ENGELMANN, M. D.,

OF ST. LOUIS.

CACTACEÆ.

I. MAMILLARIA, Haw.*

Subgen. 1. EUMAMILLARIA.

Plantæ simplices seu cæspitosæ, tuberculatæ, aculeigeræ.

Tubercula plus minus teretia seu angulata, nunquam sulcata.

Areolæ floriferæ axillares, ab areolis aculeiferis penitus distinctæ, nudæ seu villosæ, nunc setosæ.

Flores ex axillis tuberculorum anni prioris antecedentiumve orti, plerumque parvi inconspicui.

Ovarium plerumque immersum: bacca versus maturitatem solum (anno secundo in plurimis) emergens, fere semper clavata, coccinea.

Semina minuta, plerumque rugulosa seu scrobiculata, rarissime verruculosa, vix lævia, fulva, fusca, seu nigra.

Most *Mamillariæ*, heretofore known and cultivated, belong to this subgenus, which is well characterized by the lateral position of the flowers.

1. M. MICROMERIS (sp. nov.): parvula, simplex, globosa; vertice depresso; tuberculis minimis verrucæformibus confertissimis; areolis solum junioribus lana laxa longa vestitis; aculeis plurimis pluriserialibus minutis ex albido cinereis, in plantis junioribus et in tuberculis inferioribus plantarum adultarum sub-20 æqualibus lineam longis radiantibus, in tuberculis floriferis (verticem plantæ adultæ versus) 30–40 stellato-porrectis, superioribus 6–8 cæteros bis terve superantibus versus apicem clavatis acutis, parte superiore demum deciduo; floribus minimis subcentralibus; sepalis petalisque 5; stigmatibus 3 stamina æquantibus; bacca elongata clavata coccinea floris rudimenta dejiciente; seminibus paucis oblique obovatis basi acutis nigris lucidis sub lente levissime verruculosis, hilo elongato ventrali.† (Tab. I and II, fig. 1–4.)

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* I leave the character of the genus as heretofore generally circumscribed. Lemaire's genus *Anhalonium*, however, a species of which is found in our territory, in my opinion cannot be separated from *Mamillaria* so long as the generic character is founded on the organs of fructification, and not on the external shape of the plants. The expression "*Inflorescentia verticillis*," which I use in relation to the subgenera *Coryphantha* and *Anhalonium* and to the genus *Echinocactus*, although in common use, is not strictly correct: the flowers appear on the vertex of the plant, indeed, but not as the prolongation of the main axis; they are, as in all Cactaceæ, properly lateral, but produced by the young growth of the same year, while in all other Cactaceæ they spring from the growth of the preceding or former years, and, consequently, make their appearance more or less on the side of the plant, or, if on the top, only on older branches or joints.

† I look at the seed always in such a position that the radicle of the embryo points downward and the cotyledons upward, or when curved, upward and forward, or to the left. All the seeds figured in this Report are represented in this position, unless otherwise stated. We have then one *side* or *face* (produced by the always more or less distinct compression of the seed) towards the beholder, the *base* below, and the *ventral* part or edge of the seed to the left, and the *dorsal* part to the right.

The hilum is large or small, circular, oblong, oval, or elongated, mostly more or less basal, but not rarely sub-ventral or ventral; it is usually surrounded by a tumid rim, formed by the thickened testa, smoother than the other parts of the seed. The albumen, when present, or the trace of it, which is indicated by a never-wanting thickening of the endopleura, is always found, on the ventral part of the seed. The back or dorsal part of the seed is often more or less carinate, especially towards the base. The testa of the seed is pergamentaceous, yellowish, or brownish, or black; or it is hard, crustaceous, and then always black; or it is whitish and thick and bony (only in *Opuntiæ*.) The surface of the seed is smooth, often shining, or it is rugose, or pitted, or

Var. β. Greggii: major, tuberculis globoso-ovatis paullo majoribus; aculeis rigidis 2–3-seriatis, interioribus 5–7 brevioribus robustioribus, exterioribus 15–18 paullo longioribus, omnibus radiantibus; seminibus paullo minoribus leviter verrucosis. (Tab. II, fig. 5–8.)

From El Paso to the San Pedro river, also in a single locality east of this river, in naked places on mountain-tops or sides, only on limestone, never in the porphyritic region, *C. Wright.* Var. β. was collected by the late *Dr. J. Gregg* on a mountain-ridge between Azufrora and Penos Bravos, near Saltillo, Mexico.—Small globose plants, depressed at top, simple, or very rarely (and probably only after an injury to the top of the main plant) branching; heads usually ½ to 1 inch in diameter, in largest specimens seen 15–18 lines in diameter; plants densely covered by the delicate ashy-grey spines; tubercles about ½ line long, only 1–1½ lines distant from one another; older ones shedding the spines, and giving the base of the plant a very pretty tuberculated appearance; in the larger plants 21 or 34 spiral rows of the tubercles are the most distinct; spines not pungent, in several series, usually about one line long; on the younger tubercles of the fully-developed plant, (those I suppose which may bear flowers in their axils,) the 6–8 upper exterior spines are 2–3, or sometimes even 4 times as long as the other spines, (2–4 lines long,) thickened or clavate towards the end, with an acute point; these spines are the first to appear in the nascent tubercle, (as indeed is the case in all *Mamillariæ* where the uppermost radial spines are always developed before the others,) mixed with loose wool of almost the same length. These elongated superior spines form a small tuft in the vertex of the plant, which includes and partly hides the flowers and fruit. When they get older, apparently after the second or third year, the upper part of these long spines breaks off, leaving them of the same length as the others, but always distinguishable by their ragged end. These peculiar spines, of which I have not seen any analogy in other species, are wanting in younger plants.

The position of the flowers in this plant is rather a doubtful one. I have not seen living specimens in flower, but the structure of the tuft, the position of the berries in the dead specimens before me, and the note of Mr. Wright, "flowers central" would seem to indicate that they really appear in the new growth of the same season. In that case this species would be an anomalous small flowered and small tubercled *Coryphantha.* But I am yet inclined to consider the flowers as only *nearly central,* and borne in the axils of the last tubercles of the preceding season; all the analogies at least are in favor of our plant being a true *Mamillaria.* Flowers reduced to the simplest type of *Cactaceæ*, viz: 3–5 sepals, about 5 petals, two or three times as many stamens, and a style with 3 stigmata; diameter of flower about 3 lines; petals whitish or very light pink; fruit an elongated clavate red and somewhat juicy berry, 4–6 lines in length, without the remains of the flower on top, somewhat persistent on the plant, finally shrivelling up, obovate, grey, and hid in the tuft; so it is found in the specimens brought home. Seeds only 6–12 in each fruit, comparatively large, 0.7 line long, 0.5 in diameter, with a very large umbilicus; testa hard and brittle, though thin.

Var. *Greggii* is larger and coarser in all its parts. The specimens before me are 1–2 inches in diameter; tubercles 1–1½ line long; exterior spines 1½–2 lines, interior stouter ones ½–1 line long. The 6–9 upper elongated spines on the younger tubercles are 3–4 lines long,

covered with very minute or larger warts or tubercles; these tubercles are distinct, or more or less concatenate or confluent, leaving irregular pits in their interstices. Smooth or pitted seeds I find in most *Mamillariæ* and *Echinocacti*, irregularly rugose ones in some *Echinocacti* and *Cerei*, tuberculated seeds only in *Anhalonium*, the single *Echinocactus setispinus*, and all *Echinocerei*, while the species of the other sections of *Cereus* known in our Flora generally have smooth seeds. Of the quite peculiar, large, flat, and bony seeds of *Opuntiæ*, I shall find occasion to speak hereafter.

thicker at base, very slender in the middle, and thickened again towards the very acute point. Fruit about 9 lines long; seed smaller than in the more northern form, 0.6 line in length and more distinctly tuberculated.

Mamillaria microthele, Muhlenpf., seems to be closely allied to our plant, but is distinguished (to judge from the descriptions) by its cespitose growth, and its distinct 1 or 2 central spines. No allusion is made in the descriptions to the remarkable vertical tuft, though the small pale rose-colored flowers are mentioned. The same, *M. micromeris*, refers to the smallness of all the parts of this species.

2. M. LASIACANTHA (sp. nov.): parvula, simplex, globosa seu ovato-globosa; tuberculis cylindricis læte viridibus; axillis nudis; areolis junioribus albido-lanatis; aculeis 40–80 pluriseriatis omnibus radiantibus maxime inaequalibus brevibus setiformibus albis rectis seu paullo recurvatis ciliato-pilosulis vel denudatis; floribus lateralibus parvis; sepalis 13 obtusis, exterioribus mucronatis; petalis 13 fere uniseriatis oblongis obtusis emarginatisve; stylo stamina brevia longe superante; stigmatibus 4–5 ovatis brevibus erectis convergentibus; bacca elongata clavata coccinea; seminibus numerosis obovato-subglobosis scrobiculatis nigricantibus, hilo basilari ovali.

Var. *α.* MINOR: caule minore ovato; aculeis paucioribus brevioribus dense pilosulis. (Tab. III.)

Var. *β.* DENUDATA: caule majore globoso; aculeis plurimis longioribus subnudis. (Tab. IV.)

About Leon spring and Camanche spring, west of the Pecos, on low limestone hills, among herbage, *C. Wright:* fl. April and May.—A pretty little species, covered with and almost entirely hidden under the innumerable soft, more or less pubescent spines. The smaller form is 9–12 lines high and 6–9 lines in diameter; tubercles in 8 or 13 spiral rows, 2 lines long and nearly 1 line in diameter; areolæ 1½ line distant from one another. Spines 40–60, 1½–2 lines long, the upper exterior ones a little longer than the rest, the innermost ones often not half as long as the others. The larger form, var. *β*, is 1–1½ inch high, and of almost the same diameter; tubercles 2½–3 lines long, in 13 or 21 spiral rows; spines 50–80 almost, or the old ones entirely naked, 1½–2½ lines long, the innermost usually much shorter. The flower is half an inch long, and, when fully open, of the same diameter; petals white, with a red streak in the centre, which at base forms a red circle around the yellow stamens; style yellowish, with 4 or 5 yellowish-green stigmata, which form together a short globose head; fresh fruit 6–10 lines long, without the remains of the flower, somewhat persistent and finally shrivelled up, greyish, obovate-clavate, deeply imbedded and hid between the tubercles; seeds 10–25 in each fruit, smaller than in the last species, and altogether different in shape and surface, about 0.5 line long, very conspicuously pitted, hard and brittle. I have named this species *M. lasiacantha* from the usually very soft pubescence of the spines. It is evidently closely allied to *M. Schiedeana*, Ehrenb.; but this is a much larger plant, with larger tubercles, very woolly axils, and its spines tipped by a silky brush. Both this and the last species belong to Prince Salm's § 3. *Polyacanthæ* ** *aculeis patentissimis adpressis*. The position of the flower, however, seems to indicate that they are widely separated from each other, though the external appearance of the plants is very much alike.

3. M. PUSILLA, DC., var. TEXANA: ovato-globosa, prolifera, cæspitosa; tuberculis teretibus versus apicem conicis, axilla longe-lanatis setosisque; aculeis pluriseriatis, extimis numerosissimis (30–50) capillaceis elongatis flexuosis vel crispatis albis, interioribus 10–12 sensim ri-

gidioribus brevioribus rectiusculis puberulis albidis, intimis 5–8 longioribus rigidis rectis pubescentibus basi bulbosis infra albidis sursum rufis fuscisve inaequalibus; florum lateralium ovario subemerso; sepalis 9–12 oblongo-linearibus obtusiusculis tenuiter fimbriatis; petalis 13–16 fere uniseriatis oblongo-linearibus obtusis vel emarginatis saepe mucronatis; stigmatibus 5 flavidis longe supra stamina exsertis; bacca elongata clavata s. subcylindrica coccinea floris rudimentis involutis coronata; seminibus plurimis obovatis scrobiculatis nigris lucidis, hilo basilari lineari. (Tab. V.)

From Eagle Pass to Santa Rosa, *Dr. Bigelow*, and, according to *Dr. Poselger*, common on the Rio Grande below: fl. March to May.—Heads 1–1½ inch in diameter, 1–2½ inches high, usually covered below with young branches, and finally densely cespitose; tubercles 3½–4½ lines long, dark-green; axillæ quite woolly, with several coarse twisted bristles mixed with the wool; exterior hair-like spines covering the whole plant as with a coarse wool, often 6–8 lines long, when straightened; interior spines slender, but stiff and pointed, 3–4 lines long, in young or weakly specimens, whitish, with dark tips, in robust ones yellow at base, brown upwards, and almost black at tip; flowers 7–10 lines long; petals dirty yellowish-white, with a reddish streak in the middle; fruit about 9 lines long; seeds 0.6 line long, hard and brittle, very similar to the seed of the last mentioned species, only a little larger and with narrow hilum.—*Mamillaria pusilla*, from the West Indies, is so near our plant that this one must necessarily be referred to it; the only difference seems to consist in the smaller number of radial spines (12–20) in *M. pusilla*, and in the greyish-green color of its tubercles.

4. M. PHELLOSPERMA (M. tetrancistra *E. partim, in Sill. Journ. Nov.* 1852): ovata seu ovato-cylindrica, simplex seu rarius e basi ramosa; tuberculis ovato-cylindricis; axillis lanatis setigeris demum nudis; aculeis radialibus numerosissimis (40–60) biseriatis, exterioribus tenuioribus brevioribus albis, interioribus robustioribus longioribus apice fuscatis, centralibus 3–4 robustioribus longioribus ex basi pallidiore atrofuscis, superioribus 2–3 rectis seu uno pluribusve hamatis, inferiore validiore sursum hamato; floribus versus plantæ apicem lateralibus; sepalis 15–17, exterioribus ovatis obtusiusculis ciliatis, interioribus oblongo-linearibus; petalis sub-12 acuminato-aristatis; stigmatibus 5; bacca obovato-clavata late umbilicata corollam marcescentem dejiciente tenui coccinea vix pulposa; seminibus magnis globosis rugosis, ad hilum massa suberosa semine ipso majore triloba fusca arilliformi auctis. (Tab. VII.)

Dry gravelly hills about the base of the mountains east of the Californian Cordilleras, near San Felipe, *Dr. Parry;* also on the lower Gila, *Dr. Le Conte, A. Schott;* on the lower Colorado, the Mojave, and east of the Colorado towards the Cactus Pass, *Dr. Bigelow*.—This interesting species was first noticed by Dr. Parry, and was described from his notes in Silliman's Journal l. c., under the name of *M. tetrancistra*. Specimens brought home since by several collectors leave no doubt that this and several other species had been confounded; and, moreover, that hardly ever all the four central spines are hooked. The original name had therefore to be altered; the one selected for it indicates the peculiar corky structure of the enlarged base of the seed.

Our species is often simple, not rarely several stems are seen coming from one base, or an older stem bears young branches at its lower part; young stems almost globose, older ones ovate, and even cylindric, 2 to 4 or 5 inches high, 1½ or 2 inches in diameter; tubercles 4–7 lines long, not so much crowded as in the allied species, in 8, or at most, 13 spiral rows. The axils of the young tubercles produce loose wool, with a few long spiny bristles, which disappear only after several years. In the smallest specimen before me I find 14–18 exterior radial spines, 4–5 lines long, and 12–16 interior ones, 5–6 lines long; in other specimens I

have counted from 50–60 radial spines. The upper central spines in my specimens are mostly 5–7 lines long; sometimes I find 1 or 2 of them longer and hooked, and sometimes all 4 are said to be regularly hooked; the lower central spine is stouter and longer than the others, 6–9 lines long, with the sharp hook always turned upwards. Flower apparently about an inch long; fruit clavate or pear-shaped 6–12 lines long, and 4–6 lines in diameter, with a thin scarlet-colored integument, torulose from the protrusion of the large seeds; the withered flower falling off leaves a wide circular umbillicus; seeds large, visible through the thin pericarp, attached to conspicuous white funiculi; seed proper 0.6 or 0.7 line in diameter, with the appendage 1.2—1.5 line long. The curious spongy or corky appendage is larger than the seed itself, and buries its lower part as it were in a bluntly 3-lobed cup. Embryo almost globose, 0.6 line long, 0.5 line in diameter; cotyledons small but perfectly distinct and visible; no albumen.—Apparently near *M. ancistroides*, Lem., with 30–40 radial and 4–5 central spines, flower and fruit unknown; the radial spines are said to be homogeneous, and the axils naked.

5. M. Grahami (sp. nov.): globosa seu demum ovata, simplex seu e basi ramosa; tuberculis ovatis basi dilatatis axillis nudis; areolis orbiculatis seu ovato-orbiculatis; aculeis radialibus uniseriatis 15–30 albis saepe apice fuscatis nudis seu puberulis, summis brevioribus, lateralibus longioribus; aculeo centrali singulo robustiore longiore sursum hamato, saepe 2 rectis sursum divergentibus adjectis, omnibus e basi pallidiore fusco-atris; floribus sub vertice lateralibus rubicundis; sepalis sub-13 lineari-oblongis obtusiusculis ciliolatis; petalis sub 13 lineari-oblongis roseatis, exterioribus mucronatis, interioribus obtusis retusisve; stylo stamina brevia longe superante; stigmatibus 6–8 elongatis filiformibus suberectis; bacca ovata (viridi?) floris rudimentis coronata; seminibus oblique obovatis scrobiculatis nigris. (Tab. VI, fig. 1–8.)

Mountainous regions from El Paso, *Charles Wright*, southward and westward to the Gila, *Dr. Parry*, and Colorado, *A. Schott*, and up this latter river as far as Williams' river and Cactus Pass, *Dr. Bigelow*: fl. from June or July to August.—Stems 1–3 inches high, 1–2½ inches in diameter, simple or somewhat branching from the base, and thereby sometimes slightly cespitose; tubercles 3 lines long, and when old of a corky texture, persistent when dead and dry like those of *M. tuberculata*, disposed in 13 or 21 spiral rows. Radial spines in some smaller specimens 25–30, in larger ones often only 20–25, and in some Sonora specimens only 15–18 in number; the lateral ones are the longest, about 3–4 lines, or in the largest specimens even 5–6 lines long; lower spines shorter, upper ones the shortest and most slender. In smaller specimens only one central spine is observed, generally much longer than the radial spines, 3–9 lines long, with a wide or sometimes a narrower hook, always curved upward. In many specimens one or two upper spines are found, neither so stout nor so long as the lower hooked one, and always straight; flower 9–12 lines long, rose-colored; fruit a small oval berry, about half an inch long, apparently green when ripe; seeds among the smallest in this genus, only 0.4 or rarely 0.5 line long, slightly pitted, with a small and narrow hilum.—This pretty species has been named for *Col. J. D. Graham*, of the United States Corps of Topographical Engineers, under whose auspices many of these species were collected.

6. M. Wrightii (sp. nov.): globosa seu depresso-globosa, basi obconica, simplex; tuberculis teretibus; axillis nudis; aculeis radialibus sub-12 albidis summis 3–5 paullo robustioribus apice fuscatis, lateralibus sublongioribus, inferioribus gracilioribus; aculeis centralibus plerumque binis divergentibus uncinatis fusco-atris radiales subsequantibus; floribus lateralibus (?); sepalis exterioribus 13 triangularibus obtusiusculis fimbriatis, interioribus 8 acutis margine

petaloideis; petalis 12 lineari-lanceolatis acuminatis aristatis purpureis; bacca majuscula ovato-globosa succosa purpurascente floris rudimentis coronata; seminibus obovatis basi acutis nigris scrobiculatis, hilo subventrali parvo angusto. (Tab. VIII, fig. 1–8.)

New Mexico, near the Copper mines, *Wright*; near El Paso, *Parry*; and on the upper Pecos, east of Santa Fé, *Bigelow*.—Stems 1½–3 inches in diameter, hemispherical above, flattened or depressed in the centre, and top-shaped below; simple, as all the *Mamillariæ* of that form usually are. Tubercles 5–6 lines long; spines 4–6 lines in length, shorter in the southwestern, longer in the northeastern specimens; uppermost radial spine stouter than the others, with a brown tip, or smaller and slender, or entirely wanting; central spines usually 2 side by side, diverging laterally, or rarely one above the other; sometimes only one, or not seldom 3, the third one being below the two others; the hooks usually turned downward, or in different directions. The flowers seem to be lateral but very near the vertex, the fruit is moved more outward by the continuous growth of the plant. Flower about an inch long and fully as wide; petals and margin of inner sepals bright purple. Berry large, nearly an inch long, purplish; seed similar to that of *M. Grahami*, but much larger; and the very small and narrow hilum ventral; length of seed 0.7 line.—This species I with pleasure dedicate to my friend, *Mr. Charles Wright*, to whose indefatigable exertions botany owes so many new discoveries along the Mexican boundary line, and lately in more distant parts of the globe.

7. M. Goodrichii, Scheer: globosa seu ovata, subsimplex; vertice tomentoso; tuberculis ovatis abbreviatis; axillis junioribus lanatis setigeris demum nudatis; aculeis radialibus 11–15 (plerumque 12–13) albidis apice sphacelatis intertextis, centralibus 3–4 (in plantis junioribus subsingulis) fusco-atris, superioribus divergentibus rectis seu rarissime subuncinatis, inferiore paullo longiore robustiore sursum hamato; floribus in vertice lateralibus parvis; petalis lanceolatis acuminatis sordide flavidulis medio rubellis; stigmatibus 3 virescentibus. (Tab. VIII., fig. 9–14.)

Dry ravines near San Diego, California, *Dr. Parry;* originally brought to England from the Island of Cerro on the Californian coast.—One of the specimens of Dr. Parry, from which the above description was drawn, is 2 inches high, and 1½ inch in diameter, the other is globose and rather depressed; the tubercles are 1½–2½ lines long and of a somewhat corky texture, like those of *M. Grahami*, so that the dead ones retain their shape and do not shrivel up. The axils produce a very dense wool, and in it 5–8 stiff bristles which often reach the length of the tubercle. The radial spines are 2½–3½ lines long, the uppermost one present or wanting. The upper central spines, 2 or 3 in number, are straight, or rarely in my specimens with a tendency to form a hook; the lower central spine is the longest one, 4½–5 lines long, the narrow, or rarely wide hook is turned upward or sidewise. Flowers 6–9 lines long, 6 lines wide, dirty yellowish, the petals with red midribs.

8. M. Heyderi, Muhlenpf., of which my *M. applanata*, (Plate 9, fig. 4–14,) and *M. hemisphærica*, (Plate 9, fig. 15–17,) published in *Plantæ Lindheimerianæ*, are different forms, is common throughout the southern parts of New Mexico, and may even extend into Sonora, according to Mr. Schott's notes, unless what he has seen is a form of M. *gummifera*, (Tab. IX, fig. 18–20,) brought by Dr. Wislizenus from the mountains west of Chihuahua. The Sonora plant is stated to have 13 radial spines, the inferior ones are 6–8 lines and the superior ones 2–3 lines long, the stout central spine is of the length of the latter.

9. M. MELACANTHA (sp. nov.): simplex, hemisphærica seu vertice depressa, basi obconica, lactiflua; tuberculis pyramidato-quadrangulatis compressis basi productis axilla nudis; areolis junioribus albido-villosis mox nudatis; aculeis paucis (5–9) rigidis rectis vel recurvatis albidis seu flavidis (demum cinereis) apice sphacelatis, inferioribus paullo longioribus, centrali singulo robusto breviore porrecto seu sursum flexo et cum cæteris radiante seu rarius nullo; floribus sordide albidis rubellisque; ovario nudo; sepalis 12–14 lanceolatis; petalis 14–16 linearilanceolatis acutis subintegris; stigmatibus 6–7 stamina brevia vix excedentibus flavidulis; bacca elongato-clavata incurva floris rudimenta dejiciente; seminibus minutis obovatis rugulosis fulvis. (Tab. IX., fig. 1–3.)

Throughout New Mexico, from where it was first brought home by the Missouri Volunteers in 1847; often collected since by the different explorers of the botany of those regions: fl. May and June.—Very nearly allied to the foregoing species; distinguished by the fewer more loosely arranged tubercles, which rise from a much broader base, and by the fewer, shorter and stouter spines. Plants 3–5 inches in diameter, with a broad top-shaped base, terminating in the large fleshy root; tubercles 7–9 lines long, strongly quadrangular, somewhat compressed from above, arranged in 13 spiral rows. Spines, as indicated by the name, fewer than in the allied species, 5–9, usually about 6, lowest one mostly a little longer than the lateral ones, 3–5 lines long, stout, and strongly subulate, often curved in different directions; upper spine wanting or often replaced by the stouter and a little shorter central spine, which is then turned upwards. Spines in robust specimens dirty yellowish with brown points; central one darker than the rest; in young and weakly specimens they are whitish. Flowers 12–14 lines long, somewhat urceolate; exterior petals longest, entire; interior ones a little shorter, entire or slightly denticulate; all whitish with a broad rose-colored line in the centre. The ovary does not exude the milky fluid, which the tubercles and other parts of the plant contain. Fruit ripening the second spring and summer, till then hidden between the bases of the surrounding tubercles, and for the greater part buried in the tissue of the plant; in spring the young fruit suddenly (in one or two weeks) grows to its full size, 9–12 or even 15 lines long, protruding far above the tubercles and forming an interior scarlet circle around the inner circle of rose-colored flowers. Seeds 0.5 line long subglobose-obovate, with a narrow sub-basilar hilum, yellowish brown, rugose and somewhat pitted.

10. M. SPHÆRICA, (Dietrich): e radice crassa obovata seu clavata, prolifera et demum densissime cæspitosa; tuberculis ovato-elongatis versus apicem acutatum conicis, axilla lanatis; areolis junioribus breviter tomentellis; aculeis setaceis basi bulbosis rectis seu curvatis albidis, radialibus 12—14, centrali singulo recto subulato subbreviore vix robustiore; flore subverticali magno flavo; tubo supra ovarium emersum constricto elongato; petalis sub-18 acuminatis aristatis integris; stigmatibus 8 linearibus patulis.

Hillsides on the Rio Grande near Eagle Pass, *Schott*: fl. from March throughout the season.—Dr. Poselger's specimens were collected at Corpus Christi, on the coast of Texas. Dietrich's description, taken from them, well agrees with Mr. Schott's plants and with specimens now frequently cultivated at St. Louis, from both of which the above character is drawn.—This species is remarkable on account of its exsert ovary and large flower, by which characters it closely approaches to the next subgenus; but the flowers, though apparently nearly vertical, come from last year's growth. Specimens before me are 2 inches high, 1¾ inch in diameter above, narrowed below, the old tubercles withering and leaving a short clavate scaly stem. The

tubercles soon become proliferous, and the branches increase and reproduce often in such a manner as to form large and dense hemispherical masses. Tubercles 6–8 lines long; spines 3½–4½ lines long; flowers 1½–2 inches in length, and fully as widely open in bright sunshine; tube slender, funnel-shaped, remarkably constricted above the oval ovary. Fruit not seen.

Subgen. 2. CORYPHANTHA.

Plantæ simplices seu caespitosæ, tuberculatæ, aculeigeræ.

Tubercula plus minus teretia, florifera facie superiore longitudinaliter sulcata, in stirpibus junioribus nondum floribundis sulco breviori notata, vel penitus esulcata.

Areolæ floriferæ axillares seu in tuberculo ipso supra-axillares, cum areolis aculeiferis sulco villoso plus minus profundo demum nudato subinde glandulifero junctæ, tomentosæ.

Flores ex areolis tuberculorum hornotinorum adultorum (inde laxi) seu vix evolutorum (inde congesti) oriundi, plerumque magni, speciosi.

Ovarium emersum: bacca plerumque anno primo, rarissime anno secundo, maturescens, ovata seu subglobosa, viridis seu raro coccinea, sæpissime floris rudimentis coronata.

Semina plerumque majuscula, fulva, fusca seu nigra, lævia seu scrobiculata, nunquam tuberculata.

This subgenus, characterized mainly by the vertical position of the flowers, principally comprises species from the northern border of the Cactus region, most of them, until lately, unknown, or imperfectly known, to botanists. All the *Mamillariæ* of the Upper Missouri, and most of those from Texas and New Mexico, with which I had become acquainted, have grooved tubercles and showy vertical flowers, which fact I indicated as early as 1845, in the Plantæ Lindheimerianæ, and again in 1848, in Wislizenus' Report. Dr. Poselger, who, in his travels in Texas and Mexico, had the best opportunity of studying these plants, further verified this fact, and first noted that all the top-flowering *Mamillariæ* had grooved tubercles, at least in the fully developed parts of the plant; and he justly inferred that all *Mamillariæ* with grooved tubercles (the section *Aulacothecæ*) belong here. But he went further, and removed them from *Mamillaria* to *Echinocactus*, solely on account of the vertical flowers. Now some *Mamillariæ* of this section (e. g. *M. robustispina*) do approach *Echinocactus* in the shape of their embryo, as do others (e. g. *M. macromeris*) by having an occasional sepaloid scale on the ovary; while some *Echinocacti* (e. g. *E. setispinus*, *E. horizonthalonius*) have a straight embryo with very short connate cotyledons, and others have few and somewhat fugacious sepaloid scales on the ovary, (e. g. *E. intertextus*, *E. setispinus*.) Still I think that a safe line of distinction can be drawn between them, and that *Coryphantha*, though forming a transition to *Echinocactus*, much rather belongs to *Mamillaria*. But it must be admitted that the characters distinguishing most genera of Cactaceæ are almost as difficult to define as those of the species.

11. M. NUTTALLII, β CÆSPITOSA (M. similis, *E. in Plant. Lindh.* 1845) has been collected by Mr. Wright and others in the same part of Texas where Mr. Lindheimer had originally found it, viz: from the Brazos to Austin and San Antonio; it has since also been brought from the Kansas river, but does not seem to extend into the mountains of Western Texas. (Tab. LXXIV, fig. 6–7.)

12. M. SCHEERII, Muhlenpf. β? VALIDA: magna, robusta, ovato-globosa, simplex seu ad basin parce prolifera, glaucescens; tuberculis magnis remotis patulis e basi lata subcylindricis, supra sulco profundo glandula singula paucisve munito (juniore lanato) subbilobis; axillis latis,

junioribus dense tomentoso-lanatis; areolis orbiculatis villosissimis demum nudatis; aculeis 10–20 rectis seu subinde curvatis robustis rigidis basi bulbosis albidis seu citrinis apice fuscatis, radialibus 9–16, (3–5 inferioribus lateralibusque æquilongis robustioribus compressis, 7–11 superioribus debilioribus teretioribus), centralibus 1–5 validis augulatis paulo longioribus pallidis citrinis seu rubicundis, singulo validissimo porrecto; floribus in vertice tomentosissimo laxis flavis; sepalis 16–22 lanceolatis, inferioribus ciliatis; petalis 16–20 oblongo-lanceolatis versus apicem denticulatis mucranatis; stigmatibus 6–10; bacca viridi.

Sandy ridges in the valley of the Rio Grande, from El Paso to the Cañon; also at Eagle Spring, and on prairies at the head of the Limpia, *Charles Wright:* fl. in July.—A stately plant, by far the largest of the northern *Mamillariæ;* largest specimens before me, 7 inches high, 5 inches in diameter without the spines. Tubercles loosely arranged, in the smaller specimens in 8, in the larger ones in 13 spiral rows, at base ¾–1 inch in diameter, suddenly contracted and almost cylindric, 1-1½ inch long, and 5-7 lines in diameter, spreading, ascending; tubercles on the lower part of plant shorter, more conic, and somewhat imbricated. Groove very deep, with 1-5 orbicular depressed or hemispherical warts or glands, of nearly a line diameter. Central spines 10–18 lines long, mostly yellow; lower radial about 9–15, upper 5–10 lines long, when young mostly red at base, paler in the middle, and dark purplish-black at tip, sometimes yellowish; when old, all the spines become ashy-gray with dark tip. Flowers 2 inches long, yellow, ovary 5–6 lines long. Young and small specimens have smaller tubercles, and about 6–8 radial spines 6–9 lines long, with a single straight or recurved much stouter central one, an inch long.

M. Scheerii, from Chihuahua, is distinguished from our plant, according to Prince Salm's description, by the shorter and fewer (8–11) radial spines, and the single "much longer, one inch long," central spine; it is globose, 3–4 inches in diameter; flowers of same size as ours, with apparently entire (?) sepals, and red-streaked yellow petals. The areolæ are described as naked, while in our plant we find the young ones very thickly covered with long wool, which disappears by age. Nevertheless, I consider ours only as a northern form of the Chihuahua species, with more numerous and stouter spines; which character very often distinguishes northern and southern varieties of one and the same species.

13. M. ROBUSTISPINA, A. Schott in litt.: robusta, simplex seu cæspitosa; tuberculis magnis patulis subteretibus sulcatis; areolis magnis orbiculatis, junioribus dense tomentosis; aculeis radialibus 12–15 robustis rigidis, inferioribus robustioribus obscurioribus rectis seu deorsum curvatis, superioribus rectis fasciculatis paullo tenuioribus; aculeo centrali singulo valido compresso deorsum recurvato, subinde altero superiore rectiore adjecto, aculeis omnibus corneis apice atratis subpollicaribus; floribus e basi tuberculorum juniorum villosissima campanulatis luteis; tubo supra ovarium ovatum constricto tenui, intus ad basin usque filamentoso; sepalis lanceolatis, inferioribus ciliolatis; petalis numerosis; stigmatibus 9–10 patulo-erectis; bacca viridi; seminibus magnis oblique obovatis circa hilum parvum lineare centrale curvatis fuscis; cotyledonibus distinctis foliaceis. (Tab. LXXIV, fig. 8.)

On grassy prairies on the south side of the Babuquibari mountains, in Sonora, *A. Schott:* fl. July.—A large plant, cespitose, perhaps from the effects of prairie fires, as Mr. Schott suggests. Tubercles nearly an inch long, and about an inch distant from one another; areolæ 3½–4 lines in diameter; spines 9–15 lines long, lower ones stouter but a little shorter than the upper ones, dark on the upper and lighter colored on the lower surface; central spines 1 or sometimes

2, stouter, but not much longer, than the others; base of lower or principal central spine nearly one line wide. Flowers, 1½–2 inches long, well characterized by the slender tube, which is contracted above the ovary, and quite similar in that respect to the flower of *M. sphærica* (see above); petals "saffron yellow"; filaments from the base of the tube, leaving no naked space above the ovary, as is the case in most species. Seeds 1.5–1.6 line long, and fully a line in diameter, the largest of any *Mamillaria* examined by me; albumen more distinct than usual in this genus; embryo curved, with somewhat foliaceous accumbent cotyledons, resembling much more the embryo of some *Echinocactus* than that of any *Mamillaria* known to me. The plant is evidently nearly allied to the foregoing, and also somewhat to the last species, but is distinguished by the very stout spines, and especially the slender and constricted tube of the flower. In *M. Scheerii* the filaments leave the lowest part of the tube free.

14. M. RECURVISPINA (sp. nov.): simplex, globosa seu depresso-globosa; tuberculis ovatis obtusis profunde sulcatis confertis subimbricatis; areolis obliquis ovatis; aculeis radialibus 12–20 basi bulbosa compressis rigidis recurvis flexuosisve albidis seu corneis apice sæpe adustis intertextis; aculeo centrali singulo (interdum secundo superiore adjecto) robustiore longiore obscuriore decurvato seu raro rectiusculo; floribus in axillis villosissimis tuberculorum juniorum subverticalibus majusculis flavicantibus extus fuscatis; sepalis lanceolatis acutis integris; petalis erosis.

Eastern parts of *Pimeria Alta*, in Sonora, especially in the Sierra del Pajarito, *A. Schott:* fl. June to August.—Heads single, mostly depressed, "4–8 inches in diameter" (a living specimen before me has only 3 inches.) Tubercles in my specimen in 13 spiral rows, 5–6 lines long, ovate, somewhat compressed from above; areolæ very oblique, ovate, 2–2½ lines long, white woolly when young. Radial spines, in my living specimen, 14–16; in a dried one, as many as 20; according to Mr. Schott's notes, 12–14. One spine is distinctly superior, and one inferior; the others are closely arranged along both sides of the areola, 4–9 lines long, upper ones often a little longer than the lower ones. Central spine 6–10 lines long, dark, mostly strongly recurved, adpressed, so that the plant can easily be handled without hurting; much like *M. compacta* from the mountains west of Chihuahua, to which it bears a strong resemblance. It seems to be fully distinguished, however, by the arrangement of the flowers, which in ours originate from the base of full-grown tubercles, and are scattered over the top of the plant, being pushed out by younger tubercles, bearing new buds; while, in the Chihuahua species, they come from the axils of young, just growing, tubercles, and are crowded on the densely woolly top. Flowers about 1½ inch long, and of the same width; petals lemon-yellow, darker, and with a brownish tinge outside along the midrib.

15. M. PECTINATA, (sp. nov.): simplex, globosa; tuberculis e basi quadrangulata conicis, inferioribus abbreviatis, summis floriferis teretibus longioribus sulcatis; areolis orbiculato-oblongis; aculeis 16–24 omnibus radiantibus plerumque subæqualibus seu summis fasciculatis longioribus, e basi bulbosa lateraliter compressa subrecurvis, pectinatis luteo-albidis demum cinereis apice sæpe sphacelatis intertextis; floribus e vertice tomentosissimo centralibus flavis; ovario globoso; tubo brevi amplo; sepalis sub-30 acutis aristatis, exterioribus lanceolatis apice recurvis, interioribus oblanceolatis adpressis; petalis sub-30 pluriserialibus oblanceolatis seu infimis obtusis retusisve, omnibus herbaceo-aristatis; stigmatibus 9–10 linearibus luteo-albis stamina longe superantibus; bacca ovata viridi floris rudimentis coronata; seminibus elongato-obovatis compressis lævibus lucidis fuscis, hilo parvo ventrali. (Tab. XI.)

On gentle slopes of the limestone hills on the Pecos, and at Leon spring, abundant at the latter place, (*Charles Wright*): fl. in June and July.—The globose heads are 1½–2½ inches in diameter; tubercles in 13 spiral rows, lower ones 2–3 lines long, and somewhat broader at base, not grooved, or with a very short groove near the spines; upper tubercles 5–6 lines long, and grooved all the way down. Spines on lower part of plant nearly equal in length on each tubercle, 3–4½ lines long, as stiff and pointed and almost as closely and regularly set as in *Cereus pectinatus*, whence the specific name. On the flower-bearing tubercles the upper spines are elongated, mixed with a few stouter ones, and fasciculated; lower ones 5–6 lines long, and upper ones, forming a tuft about the apex of the stem, 6–9 lines long. Flower over 2 inches long, and 2¾ inches in diameter when fully open, between 11 and 12 o'clock, closing already about 1 o'clock, though exposed to the full glare of the sun. Ovary 3–4 lines long; exterior sepals reddish-green, interior ones yellow, with a darker midrib; petals of a beautiful sulphur yellow, broadest in the upper third and obtusish. Filaments reddish, short, covering the whole base of the tube, leaving no naked space. Fruit about half an inch long, ripening on the vertex, and not pushed aside by succeeding young tubercles, as it seems that no new ones are developed till the fruit is fully ripe, or probably till the succeeding spring. This is the case with several allied yellow-flowering species, but not with other red-flowering ones, hereafter to be described; in these, though the flower (or at least the flower-bud) be vertical, the succeeding rapid growth pushes them aside, and still more the berries, which finally appear quite lateral. Seed 0.9 line long, elongated, compressed, rounded at the back, quite sharp at the anterior or ventral edge, on the lower part of which, in a slight curvature, the small and narrow hilum is situated.

16. M. Echinus (sp. nov.): simplex, globosa seu subconica; vertice dense tomentoso; tuberculis in planta adulta teretibus apice conicis supra sulcatis; areolis orbiculatis; aculeis rectis seu paullo curvatis cinereo-albidis apice sæpe obscurioribus, radialibus 16–30 pectinatis, superioribus longioribus fasciculatis, centralibus 3–4 validioribus e basi bulbosa subulatis, superioribus 2–3 sursum versis et cum radialibus superioribus implicatis, inferiore validissimo subulato recto (seu rarissime paullo recurvo) porrecto; floribus verticalibus flavis; sepalis 20 linearilanceolatis mucronatis integris, petalis 20–30 angustis; stigmatibus sub-12 stamina longe superantibus; bacca centrali oblonga viridi floris rudimentis coronata; seminibus ut in præcedente. (Tab. X.)

On limestone hills in the region of the Pecos, *Wright*, and from Presidio del Norte to Santa Rosa, *Bigelow*: fl. in June.—A very striking plant, characterized by the unusually stout and subulate lower central spine, which together with the globular shape, gives it the appearance of some Echinite, whence the name. Specimens before me 1½–2 inches in diameter, tubercles 5–6 lines long, in 13 spiral rows. The numerous slender but very stiff whitish radical spines, laterally compressed at the thickened base, are densely interwoven and closely adpressed; lower ones about 5 lines long, lateral ones somewhat shorter, upper ones 6–8 lines long; upper interior spines stouter and rather longer than the upper radial ones, but otherwise hardly distinguishable from them; the lower central spine is also about 6 or 8 lines long, very regularly subulate from a thick base. Flowers between 1 and 2 inches long, to judge from the shriveled specimens seen, yellow; fruit over half an inch in length; seeds about 0.9 line long, entirely similar to those of the last species, to which this, perhaps, too closely approaches. All the specimens

from the Pecos have very straight central spines; but some from Presidio del Norte, not otherwise different, have somewhat recurved and darker horn-colored central spines.

17. M. SCOLYMOIDES, Scheidw.; a small slender-spined form was collected by *Mr. Wright* on the Pecos, and by *Dr. Bigelow* about Santa Rosa. Tubercles compressed, incurved, imbricated; radial spines on the upper ones about 20, with 4 longer and darker incurved central ones, the upper ones bent upwards and almost mixed with the upper radial ones; lower one mostly over an inch long. This species and the two preceding may possibly be forms of De Candolle's *M. cornifera*.

18. M. CALCARATA, E. in Pl. Lindh., has been collected by *Mr. Wright* as far west as the Nueces river. His specimens have only 8 or 10 radial spines, 4–6 lines long; central spine of the same length, but stouter, often (in young specimens?) entirely wanting. *Lindheimer's* original specimens from the neighborhood of the Colorado and Guadalupe rivers, have 10–12 radial spines 8–9 lines long; central spine stouter but shorter, sometimes wanting; seeds similar to that of *M. pectinata*, but larger and very obtuse at base; 1–1, 2 lines long. (Tab. LXXIV, fig. 1.)

19. M. TUBERCULOSA (sp. nov.): ovata seu ovato-cylindrica, simplex seu ad basin ramosa; tuberculis e basi rhomboidea ovatis abbreviatis obtusis, subcompressis, profunde usque ad axillam villosissimam sulco villoso exaratis confertis imbricatis, demum nudatis suberosis persistentibus; areolis orbiculatis, novellis albo-tomentosis; aculeis exterioribus 20–30 rigidis gracilibus albidis nunc apice sphacelatis radiantibus intertextis, interioribus 5–9 robustioribus sursum cæsio-purpureis apice sphacelatis, quorum superiores longiores erecti versus caulis apicem in comam aggregati, inferior brevior robustus porrectus deflexusve; floribus in vertice densissime tomentoso centralibus pollicaribus dilute roseis; sepalis 16–18 lanceolatis arachnoideo-fimbriatis; petalis 10–13 lineari-lanceolatis aristatis subintegris; bacca ovata elongata floris rudimentis breviter convolutis coronata rubra; seminibus subgloboso-obovatis scrobiculatis fuscis, hilo ovato minuto ventrali. (Tab. X., fig. 1—6.)

From the Pecos to Leon springs, Eagle spring, and El Paso, on the higher mountains, *Wright*; especially on the rocky summits of the "Flounce mountains," below El Paso, *Bigelow*: fl. in May and June.—A very pretty and well defined species of the mountain region. Stems 2–5 inches high, 1–2 inches in diameter, often with globose branches at the base; tubercles mostly only 3 lines long, and of the same width at base, often shorter, rarely and only in very vigorous plants 4 or even 5 lines long; in 13, or on the lower part of old plants in 21, spiral rows, like the whole body of the plant, of a corky texture and substance, almost dry, and therefore not shrivelling when old, but after shedding the spines, persistent and covering the older parts of the stem as grey, corky tuberosities, whence the name. The deep, densely woolly groove, and the very woolly axilla, which loses its coating only after several years, are quite peculiar to this species. Radial spines usually 22–26, rarely less than 20, and never in the numerous specimens examined by me more than 30, very slender but stiff, usually 2–4 lines long, lower and a few upper ones 2 lines, most upper ones 3–4 lines long, uppermost rarely 5 or even 6 lines in length; lower stout central spine 3–4, upper ones 5–7, and in a few specimens even 8 or 9 lines long; those of the uppermost tubercles crowded together, erect, forming a purplish grey tuft, which surrounds and partly hides flowers and fruit. Flowers very pale purple, about one inch in diameter; berry oval, elongated, and sometimes almost cylindric, red, and by both these characters distinguished from the fruit of the allied species; remains of flower not irregu-

larly shrivelled up as in those species, but forming a regular, conic, whitish head on the red fruit. Seeds 0.4 or 0.6 line long, unusually thick, with a very small oval, not linear, hilum.

20. M. DASYACANTHA (sp. nov.): simplex, subglobosa; tuberculis teretibus leviter usque ad basin sulcatis laxis; axillis sulcoque subvillosis mox nudatis; areolis orbiculatis novellis, albotomentosis; aculeis gracilibus vix spinescentibus rectis patulis, exterioribus 25–35 capillaceis albidis apice sphacelatis, interioribus 7–13 setaceis longioribus infra pallidioribus sursum purpureo-fuscis apice atratis, centrali singulo æquilongo porrecto nunc deficiente; florum parvorum centralium sepalis arachnoideo-fimbriatis; baccis verticalibus ovatis parvis; seminibus obovato-globosis angulatis scrobiculatis nigricantibus; hilo lineari subventrali. (Tab. XII, fig. 17–18.)

El Paso and Eagle springs, *Wright.*—The few specimens before me are from 1½–2½ inches high, a little less in diameter; tubercles slender, 4–5 lines long, in 13 spiral rows; grooves slightly hairy when young; axils more or less villous, soon becoming naked. Spines not strictly radiating, but loosely spreading, much more slender than in the last and the next species, often even capillary; exterior ones 3–6 or even 9 lines long; interior spines forming a circle corresponding with the interior ones, but darker, stiffer, and longer, upper ones 8–12 lines, lower ones 6–9 lines long, or in some specimens shorter and slenderer; central spine single, erect, 6–10 lines long, often wanting. The dry and shrivelled fruit, found on the tomentose vertex, was only 3½ lines long; seeds thick, sometimes triangular, with a very broad back, 0.4–0.6 line long, almost black; hilum quite different in shape and position from that of the next species, to which this is closely allied. The plant so much resembles *Echinocactus intertextus* var. *dasyacanthus* that, at first sight, it might be taken for it.

21. M. VIVIPARA, Haw. (Cactus viviparus *Nutt. Gen.*) This species is found only on the northwestern plains, along the Upper Missouri and Yellowstone rivers, and up into the Black Hills and Rocky Mountains. It is a low plant, either simple or usually profusely proliferous and cespitose, shoots always from the base of the groove on the tubercle, or the axil proper, while in *M. calcarata* they come from the upper part of the groove, just below the spines. Radial spines 12–20, stiff, white, often brown-red at the top, 3–4 lines long; central spines 4, (3 pointing upwards, and the stoutest and shortest downwards,) but sometimes less, and often more, as many even as 8, usually 4–6 lines long; flowers central, large for the size of the plant, about 1½ inch long, and even more in diameter when fully open, (which is after one o'clock, later than in most other Cactaceæ,) with thirty or more delicately fimbriate recurved sepals and 25–40 narrow acuminate purple petals, which are naked or fimbriate at base; filaments whitish or purplish, almost from the base of the tube; anthers orange; style long-exserted with 5–10 linear pale or purple stigmata, which are pointed with a short mucro. Berries becoming lateral, being pushed aside by the continuous growth from the apex of the plant, oval, ½–¾ inch long, pale green, juicy, and slightly acid, full of yellowish-brown seeds. These are 0.7–0.8 line long, obliquely obovate, somewhat concave on the compressed ventral portion about the small oblong-linear hilum, pitted; albumen more distinct than in most other *Mamillariæ;* embryo straight, linear-oblong, with very short connate cotyledons. (Tab. LXIV, fig. 3.)

The following form, from Texas, which formerly I thought I could distinguish from this northern species, seems to be connected to it by numerous intermediate forms, found in the geographically intermediate region of New Mexico:

Subspec. *β.* RADIOSA: ovata seu demum subcylindrica, simplex seu e basi ramosa; tuberculis teretibus laxis leviter sulcatis; aculeis radialibus numero maxime variis (12–40), superioribus

longioribus robustioribus, centralibus, 3–12, quorum superiores robustiores, radialibus longiores, inferior robustus porrectus brevior; floribus in vertice demum lateralibus; sepalis 30–40 lineari-lanceolatis arachnoideo-fimbratis apice recurvis squarrosis; petalis totidem linearibus sensim acuminatis integris seu exterioribus basi fimbriatis; stigmatibus 5–10 obtusis purpureis tulis; bacca ovata floris rudimentis coronata viridi; seminibus obovatis scrobiculatis fulvis, hilo erecto parvo lineari ventrali.

Var. *α.* BOREALIS: ovata seu subglobosa, subsimplex; aculeis radialibus 12–20, centralibus 3–6 purpureo-maculatis; floribus minoribus; sepalis sub-25; petalis sub-30; seminibus minoribus ventre concavis. M. vivipara, var. *E. in Pl. Fendl. in Mem. Am. Acad.* (Tab. LXXIV, fig. 4.)

Var. *β.* NEO-MEXICANA: ovata seu ovato-cylindrica, sæpe e basi ramosa; aculeis radialibus albidis sub-30 (20–40), centralibus 6–9 (3–12) infra albidis sursum purpurascentibus apice atratis; floribus majoribus; seminibus majoribus ventre subconcavis.

Var. *γ.* TEXANA (M. radiosa, E. in Pl. Lindh.): ovato-cylindrica, subsimplex; aculeis radialibus 20–30 albidis apice adustis, centralibus 4–5 flavis seu fulvis; floribus majoribus; sepalis 40–50; petalis 30–40; stigmatibus 7–9; seminibus magnis ventre subconvexis. (Tab. LXXIV, fig. 5.)

Var. *α* has been collected in Northern New Mexico and about Santa Fé, by *Wislizenus* and *Fendler*: *β*, in the western parts of Texas and the southern parts of New Mexico by *Wright* and *Bigelow*; by the latter also on the upper Pecos, and in Sonora (a form with more spines than any other) by *Schott*. Var. *γ* was sent by *Lindheimer* from the Pierdenales, a tributary of the Guadalupe in western Texas: fl. in May and June.—Var. *γ* is the largest form, 2–5 inches high, with flowers 1½–2½ inches in diameter when fully expanded, and seeds fully 1 line long. Var. *β* is an intermediate form, 1½ or 2 to 4 inches high, 1–2½ inches in diameter; tubercles 3–6 lines long; spines very variable in length and number; in smaller, younger specimens, the exterior spines are 2–4 lines, and the interior 3–6 lines long; in larger ones the former are often 3–8 lines, and the latter 5–10 lines long. Seed 0.7–0.9 line long, almost straight on the side of the hilum, or usually somewhat concave.—Var. *α.* approaches very near to *M. vivipara* of the north; the spines, however, are stouter; the flowers smaller; and the tubercles rarely proliferous; seeds as large as in the last, and of similar shape.

22. M. MACROMERIS, E. in Wisl. Rep.: simplex, seu ex sulcis tuberculorum inferiorum prolifera et demum cæspitosa, ovata seu cylindracea, læte viridis; tuberculis magnis e basi dilatata elongatis teretiusculis supra sulco (juniore villoso) ad medium ultrave usque ad areolam floriferam tomentosam supra-axillarem producto exaratis adscendentibus patulis laxis seu rarius plus minus imbricatis; aculeis gracilibus elongatis teretibus seu robustioribus sæpe angulatis compressisve rectis seu paullo curvatis, exterioribus sub-12 (10–17) patulis albidis seu junioribus subinde rubellis apice sphacelatis, inferioribus sæpe paullo brevioribus; aculeis centralibus 4 (in plantis junioribus sæpe 1–3 raro deficientibus,) longioribus robustoribus basi bulbosis plerumque nigricantibus, raro roseis fuscisve; floribus supra-axillaribus magnis e coccineo purpureis; ovario nudo seu squama una alterave sepaloidea munito; sepalis tubi 20–30 lanceolatis, inferioribus fimbriatis, superioribus integriusculis; petalis 20–25 oblongo-lanceolatis versus apicem denticulatis mucronatis; stigmatibus 7–8 supra stamina longe exsertis; bacca ovato-subglobosa nuda seu squamis paucis ciliatis instructa viridi; seminibus globoso-obovatis

lævibus fulvis, hilo oblongo-lineari ventricali; albumine parco; embryone recto; cotyledonibus minutis. (Tab. XIV–XV.)

In the valley of the Rio Grande, from Doña Ana, above El Paso, *Wislizenus*, to the cañon below that town, *Wright*, and to the mouth of the Pecos and to Eagle Pass, *Bigelow*, and lower down, mostly in loose sand, on hillocks confined by the roots of *Algarobia*: fl. July and August.—A splendid and very interesting species, 2–4 inches high; tubercles very different in size in different specimens, from 6 or 7 to 10 or 12, and sometimes even 15 lines long, generally arranged in 8 spirals. The groove is absent in the tubercles of the young plant; in the older ones it shows itself slightly, and only near the point of the tubercle, from the spine downwards; in more fully developed tubercles it becomes longer, till in the flower-bearing ones it reaches downward to the lower third, but never to the axilla; there it enlarges into the flower-bearing areola.—Radial spines 6–20 lines long, whitish or the upper ones or all rose-colored when young; central spines 1–2¼ inches long, the lowest one longer and stouter than the rest, mostly black, in some specimens paler, straight, or sometimes curved or twisted. Flower 2½–3 inches long, and of the same diameter, deep rose-color or carmine verging to purple, darker along the centre and towards the tip. Fruit 8 to 10 or 12 lines long; seeds different in size, 0.7–0.8 line long, short and thick, with a decidedly ventral hilum. Albumen distinct, more so than in most other *Mamillariæ*, but the embryo quite similar to them. The scales on the ovarium indicate an approach to *Echinocactus*, though the habit of the plant is decidedly that of a *Mamillaria*.—*M. dactylothele*, Lab. is a variety of this species.

Subgen 3. Anhalonium.

Plantæ simplices, tuberculatæ, subinermes.

Tuberculs subfoliacea, triangularia, lævia seu supra verrucoso-fissurata.

Areolæ floriferæ supra-axillares (an semper?), jubato-villosissimæ.

Flores ex areolis tuberculorum hornotinorum nascentium oriundi, in vertice congesti, mediocres.

Ovarium emersum: bacca floris rudimentis coronata, plerumque anno primo maturescens.

Semina majuscula, nigra, tuberculata.

These very curious plants, some of them looking more like some *Aloë* than like a *Cactus*, can nevertheless not be separated from *Mamillaria*. The seed is the only part of the organs of fructification which seems to offer any character, by having a hard, roughly tuberculated testa in ours as well as in another Mexican species which I had the opportunity to examine. Our species (and probably all the others) has the flower and fruit sessile upon the lower part of the tubercle; and elevated above the axil, much as in *M. macromeris;* but, unlike that plant, the lower part of the tubercle is entirely distinct from the upper one.

23. M. fissurata (sp. nov.): e radice crassa napiformi simplex, depresso-globosa seu applanata; vertice densissime villoso; tuberculis e basi applanta dilatata crassis triangularibus inermibus extus infraque lævibus seu versus marginem crenulatum rugosis, supra sulco centrali villoso lateralibusque 2 nudis profunde quadripartitis et sulcis transversalibus in tubercula irregularia angulosa numerosa multifidis; floribus e villo longo sericeo centralibus breviter tubulosis; sepalis sub-20, inferioribus lineari-lanceolatis integris carnosis albidis, superioribus spathulatis cuspidatis; petalis sub-12 spathulatis versus apicem obtusum mucronatum integriusculis seu laceris roseis; stigmatibus 5–10 erecto-patulis; baccis ovatis pallide virescentibus in lana

densa occultis; seminibus obovato-globosis tuberculatis nigris opacis, hilo basilari transverso; embryone obovato erecto. (Plate XVI.)

On hard, gravelly, limestone hills, near Fairy Springs, not far from the mouth of the Pecos, and between that river and the San Pedro, *Schott, Bigelow;* and higher up on the rocks of the cañon of the Rio Grande, *Parry:* fl. September and October.—The lower part of the plant is top-shaped, covered with the scale-like remains of the earlier tubercles; the upper part is hemispherical or depressed and flattened, hardly elevated above the surface of the ground, 2–4½ inches in diameter; tubercles in my specimens 6–10 lines long and a little less broad, or sometimes the upper warty part "¾ inch long and 1¼ inch wide," in 5 or 8, or rarely in 13 spiral rows. Lower part of tubercles flattened, acute at the edges, slightly carinate, more on the upper and less on the lower surface, smooth. Upper and exposed part of tubercle triangular in outline, convex, carinate and almost smooth below, convex and variously fissured and thereby verrucose above, sharp and crenate on the edges. The principal groove on the upper surface is a longitudinal one corresponding to the groove of the different species of *Coryphantha*, and like that villose; towards its base (at the base of the upper or warty part of the tubercle) it expands into the floriferous areola, upwards it ceases just under the acutish point of the tubercle without any trace of an aculeiferous areola or of spines; in the young tubercle it is coated by dense, long and straight, white or yellowish, silky wool, (about an inch long,) which from being exposed to the weather gets matted and dirty, and after several years entirely disappears. Two lateral grooves run parallel with this, and together with the many transverse fissures cut up the upper surface into numerous angular tubercles or warts. Flowers central or vertical, in the sense of the term as explained before, borne on the lower smooth part of a very young tubercle, which when bearing flower and fruit is somewhat thickened, and takes the shape and functions of a short penduncle, bearing laterally the upper part of the tubercle like a small bract. The axils even of these young tubercles are entirely naked; the long wool which covers the lower part of the flower, and entirely hides the whole fruit, being produced entirely from the areola and the central groove. Flower about an inch long and of the same diameter when fully open; ovary 3 lines long, oval; tube 4–6 lines long; 12 exterior sepals, whitish, fleshy, 8 inner ones spathulate, mucronate, with rose-colored edges 6–9 lines long, 2 lines wide; petals about 12 in a single series, 9 lines long, 2 lines wide, rose or pink-colored; stamens numerous, white with orange anthers; style white, expanding into a funnel-shaped irregularly 5–10 parted light-yellow stigma. Fruit oval, crowned with the remains of the flower, about 5 lines long, juicy. Seed 0.8 line long, strongly tuberculated, the transverse and somewhat truncate hilum basilar.

II. ECHINOCACTUS,—Link and Otto.

1. E. Schmidii, Salm: e radice tereti elongata parvus, globosus seu ovatus; costis 13 obtusis interruptis; tuberculis ovatis obtusis supra ad medium sulcatis; areolis ovato-orbiculatis junioribus albo-tomentosis; aculeis radialibus 15–18 setaceis rigidis rectis seu plerumque paullo recurvatis albidis stramineisve apice fuscatis, summo interdum elongato, centralibus 3–4 angulatis variegatis fusco-atris, superioribus rectis sursum divaricatis longioribus, inferiore porrecto hamato breviore; floribus in vertice laxis; sepalis exterioribus 13 squamiformibus, inferioribus appendiculato-auriculatis margine membranaceo laceris ciliatis, superioribus ovatis integriusculis, sepalis interioribus 8 lineari-oblongis obtusis; petalis 13 lineari-lanceolatis acutis flavo-virescentibus; stigmatibus 8 linearibus flavis; bacca virescente indistincte squa-

mata; seminibus oblique obovatis compressis minutissime tuberculatis fuscis, hilo ventrali circulari magno. (Tab. XVII.)

About Eagle Pass, on the Rio Grande, *Schott*, *Bigelow:* fl. in April.—A most elegant little species, 1½–2 inches in diameter and of the same height. Root long, terete, rather fleshy, white, about ¼ inch in diameter, such as I have not seen in any other of our *Cactaceæ*. Tubercles more distinct and less plainly arranged in ribs than in the other species of this genus; they are 4 or 5 lines high, somewhat compressed, of the same transverse diameter, and a little longer in the other direction; areola about 1½ line long, a little less broad, extending upwards into a tomentose groove, 1–2½ lines long, which terminates in the floriferous areola half-way down to the axil, as the transverse incision in the rib may be designated. This groove is much shorter or almost wanting on the tubercles, which bear no flowers. The exterior spines, with their bulbous compressed bases, are closely and regularly arranged all around the areola, and are strictly radiating; in younger plants I find 11–13, in older flower-bearing tubercles always 15–18 radial spines, 3–5 lines long, of almost equal length, or the lateral ones a little longer than the rest; the uppermost radial spine, however, is often somewhat stouter and longer, ranging rather as an upper central spine, when only 3 of these are present. The upper central spines (2 in my specimens from Eagle Pass, 3 in Salm's original plant) are stouter, somewhat compressed and angled, brown or black on the upper and whitish or mottled on the lower surface, or they are lighter throughout, with black tips; they are 8–12 lines long; the lower central spine is 2 or 3 lines shorter, black on the upper side, especially at base, and at the hooked point white on the lower surface and again on the outside of the curvature. The green flowers are about an inch long, much less in diameter even when fully open. Fruit and seed not seen by our collectors; the former is said by Dr. Poselger (who has sent me a good specimen of the plant, entirely agreeing with my specimens) to be a small green and almost naked berry; his seeds are large, about one line long, 0.8 line in diameter, with very minute and flattened tubercles, *brown* (the only *Echinocactus* with seeds of that color known to me); hilum large and circular, surrounded by a thick rim; albumen very small; embryo curved, but cotyledons small, connate, more like those of a *Mamillaria*, separating on the curvature and not at the end of the hook, as in all other hooked embryos of *Cactaceæ* known to me.

2. E. BREVIHAMATUS (sp. nov.): e radice turbinata fibrosa globoso-obovatus, atro-viridis; costis 13 compressis tuberculato-interruptis; sulcis acutis profunde incisis; tuberculis supra ad basin usque tomentoso-sulcatis; areolis orbiculatis junioribus breviter albo-tomentosis; aculeis radialibus 12 teretibus rectis albidis seu sordide flavis apice adustis, superioribus longioribus; centralibus 4 complanatis albidis apice atratis, lateralibus sursum divergentibus rectis seu paullo recurvatis aculeos radiales superantibus, summo debiliore et infimo porrecto seu deflexo deorsum hamato robustiore eos subæquantibus; floribus infundibuliformibus roseis; sepalis inferioribus (ovarii) 5–7 reniformibus scariosis ciliatis, superioribus (tubi) 8 ovato-oblongis mucronatis obtusisve; petalis 13–14 lineari-lanceolatis acutis mucronatis integris; stigmatibus 10–11 radiatis flavis stamina rubella paullo excedentibus. (Tab. XVIII, XIX.)

On the San Pedro, *Wright*, and not rare about Eagle Pass, *Bigelow:* fl. March and April.—The specimens sent by the gentlemen of the Boundary Commission were from 2 to 4 inches high, and 2–3 in diameter, of a very dark green color, and remarkable from the tuft formed on the apex by the upper central spines, in which the numerous flowers are almost entirely hidden; the lower hooked central spines stand out from the mass of the other spines, the hooks turned

downward. All the specimens grew well at first, one flowered abundantly, but all soon died from an internal rot, just as all the specimens of *E. uncinatus* did, though they were treated like the other *Cactaceæ* from the same region, which are doing well. Areolæ 2 lines in diameter, 8–12 lines distant, connected with the floriferous areolæ in the axils of the tubercles by a tomentose groove of 4 or 5 lines length. Radial spines almost always 12, very rarely 1 or 2 more, 5–10 lines long, upper ones longer than the lower, and light colored, lateral ones darker when young, but difference of shade soon lost; upper central spine 8–10 lines long, lateral ones usually 14–22 lines in length, always exceeding the upper and lower one; this last one is the stoutest and broadest of all, 9–14 lines long, mostly yellowish-brown, darker on the upper, lighter on the lower surface, and with the hook brown or black; rarely 1 or 2 additional central spines are noticed. Flower 12–16 lines long, only 9 or 10 lines wide when fully open at noon; petals 7–8 lines long, 3 lines wide, pale rose colored, with a deeper colored midrib. Fruit and seed unknown.—Near the last species, distinguished by the larger size, the very different root, the smaller number of radial spines, the shortness of the upper central spine, and the red color of the flowers; other differences will no doubt be found in fruit and seed. Name from the shortness of the hook, by which the species is distinguished from most other allied forms.

3. E. UNCINATUS, Hœpf., var? WRIGHTII: glaucescens, ovatus; costis 13 compressis tuberculatis supra usque ad basin sulcatis; areolis ovato-orbiculatis, junioribus albo-lanatis; aculeis radialibus 8, inferioribus 3 brevioribus teretibus uncinatis purpureo-fuscis, cæteris 5 compressis rectis infra stramineis sursum rubellis apice fuscis, summis longioribus latioribusque, centrali singulo complanato basi angulato flexuoso elongato hamato erecto stramineo apice fusco; floribus ex areola penitus axillari ortis; sepalis inferioribus 25–30 imbricatis squamæformibus e basi longe auriculata triangularibus hyalinis, superioribus 15–25 ovato-orbiculatis cordatis acutis purpurascentibus, superioribus 18–20 lineari-oblongis obtusis purpureo-fuscis, sepalis omnibus margine membranaceo albido ciliatis; petalis 20–30 lineari-lanceolatis obtusiusculis purpureis, internis mucronatis denticulatis; stylo supra stamina numerosissima exserto stigmatibus 10 carneis suberectis; bacca ovata rubella; seminibus curvatis oblique obovatis tuberculatis hilo circulari basilari. (Tab. LXXIV, fig. 10.)

Near El Paso, and on the river below, also at Eagle springs, on stony hills and nearly to the top of the mountains, commonly in tufts of grass or hidden among low bushes, *Wright, Bigelow*: fl. in March and April.—Oval, 3–6 inches high, 2–3½ inches in diameter, with a long tuft of the whitish hooked central spines, which are at first difficult to distinguish from the surrounding bunches of dead grass. The adult plants have generally 3, very rarely 4 lower hooked radial spines, ¾–1¼ inch long; 5 lateral and upper radial spines 1–1½ inch long, paler and flattened; the uppermost one longer, broader, and whiter than the rest; sometimes I find 6 upper spines, when the 3 outer and more slender ones appear radial, and the 3 inner and stouter ones assume the position of 3 upper central spines; there are then 6 radial and 4 central spines. The hooked central spine is 2–4 inches long, and not annulated. Young plants have 6–7 radial and 1 central spine, all terete and purplish, with darker tips, all ½–1 inch long; in older specimens, the central spine elongates, and finally becomes flattened and whitish. Groove on the tubercles 2–3 lines long, so that the *axillary* flower is distant thus far from the spines; flower 1–1½ inch long, dark purplish-red, opening at midday in bright sunshine; filaments at least 1000, yellow below, orange at tip. Fruit ovate 8–12 lines long, pulpy red,

setting off the white membranaceous sepaloid scales. Seed 0.7–0.8 line long, remarkably curved and contracted at the base; compressed, (more so in the ventral curvature,) carinate on the back, tuberculate; the small circular hilum surrounded by a very tumid, smooth, and shining rim. Albumen large; embryo hooked, with foliaceous cotyledons.

The Mexican *E. uncinatus*, of which I have seen spines and seeds collected by *Dr. Poselger*, between Saltillo and San Luis Potosi, and flowers found by *Dr. Gregg*, near Parras, has 7–8 radial spines, the 3 lower ones of which are hooked, and 4 central ones, the lowest one flattened and elongated; lower sepals 36, upper ones about 14, oblanceolate, aristate, margined; petals 25, linear-lanceolate, acuminate, aristate; 8–10 stigmata; seeds 0.6–0.7 line long, very much compressed, curved, almost cochleate, smoothish and shining; circular hilum almost ventral; albumen and embryo same as in the other. (Tab. LXXIV, fig. 9.)

4. E. SETISPINUS, E. in Pl. Lindh. Many forms have been collected by the Commission; all characterized by 13 narrowly-compressed ribs, slender flexible spines, small bright-red globose fruit, and globose-obovate oblique strongly tuberculated seeds, with an almost circular basilar hilum. The heads are globose, or usually lengthened and almost cylindrical when old, but sometimes depressed; spines short or long, the central spine usually somewhat longer than the others, but in some specimens from the Rio Grande shorter, in others from Eagle Pass much longer than the others, and erect, sometimes hardly curved. Seed usually 0.6 line long; in the above-mentioned specimen from Eagle Pass 0.8 line in length. The geographical range of this species is from the Brazos south to the Rio Grande, whence *Berlandier* has sent it under the name of *Cactus bicolor*, and west to near the San Pedro.

5. E. SINUATUS, Dietr. (E. setispinus, γ. sinuatus *Poselg.*): globosus, læte viridis; costis 13 obliquis compressis acutatis interruptis; tuberculis breviter sulcatis; areolis orbiculatis, junioribus albo, seu griseo-villosis; aculeis radialibus 8–12 setiformibus flexilibus, 3 inferioribus et 3 superioribus purpureo-fuscis rectiusculis, lateralibus 2–6 tenuioribus longioribus sæpe compressis rufis seu interdum flexuosis hamatisve albidis; aculeis centralibus 4 quorum 3 superiores graciles compressi seu sub-angulati erecti plerumque recti, infimus latior compressus seu canaliculatus flexuosus elongatus stramineus basi purpurascens apice subhamatus; floribus ab areola aculeifera paullo distantibus; sepalis inferioribus 20–30 cordato-auriculatis, superioribus 15–20 lanceolatis basi auriculatis margine membranaceis; petalis 20–25 lanceolatis sulphureis; stylo longe supra stamina exserto; stigmatibus 8–12 apiculatis erecto-patulis; bacca ovata squamis 7–10 munita viridi; seminibus obovatis seu lenticularibus hilo oblongo subbasilari excisis lucidis sub lente minutissime punctatis. (Tab. LXXIV, fig. 11–14.)

On the Pecos, San Pedro, and Rio Grande rivers, *Wright*, *Schott*.—I have above given a careful description of this plant, because it is so nearly allied to the foregoing and especially to the next species, which Dr. Poselger thinks it connects. With the former it has in common only the compressed ribs and the setaceous radial spines, but is distinguished by its size, the central spines, the fruit, and especially the seed. From the next species, to which it much more closely resembles, it is distinguished by the compressed ribs, the slender radial spines, the smaller number of all parts of the flower, the small fruit, and the smaller very finely punctate seed. My specimens are 4 or 5 inches in diameter, while Dr. Poselger's were 8 inches thick; areolæ 8–10 lines apart; 3 lower spines smooth purplish-brown, lighter at top, ¾–1 inch long, lateral spines puberulent, straw-colored, 1–1½ inch long; central spines puberulent, 3 upper ones yellowish, generally darker at base, 1½–2 inches long; lower central spine much stouter

and longer than all the others, and flattened or even channelled, pale-yellowish, often purplish at base, flexuous, more or less hooked, sometimes straight, 2–4 inches long. Flowers 2–3 inches long, yellow, apparently without the scarlet base of the petals, which I always find in both the allied species, externally greenish; fruit oval, 8–9 lines long, with 7–12 scales; green when ripe; seeds 0.4–0.6 line long. Dr. Poselger describes another form under the name of *E. setispinus δ. robustus*, which is said to have all four central, and often the three lower radial spines, also, more or less hooked. The seed which he has sent to me leaves no doubt in my mind that it is a form of *E. sinuatus*. In my specimens only the lateral spines sometimes are flexuous, or hooked, or almost curled.

6. E. LONGIHAMATUS, Galeotti: subglobosus seu demum ovatus, læte-viridis, costis 13–17 sæpe obliquis tuberculato-interruptis latioribus obtusis; tuberculis ovatis supra brevissime sulcatis; areolis ovatis seu suborbiculatis distantibus; aculeis junioribus demum totis cinereis; radialibus 8–12 rectis curvatis flexuosisve patulis, superioribus gracilioribus pallidioribus, infimo brevi, lateralibus longioribus subannulatis; aculeis centralibus 4 (1–4 superioribus adventitiis subinde adjectis) angulatis compressis annulatis, quorum superiores recti seu curvati seu contorti sursum versi, infimus robustior plerumque longissimus sæpe flexuosus plus minus uncinatus porrectus vel deflexus; floribus ab areola aculeifera vix sejunctis infundibuliformibus, limbo patulo; ovario ovato; sepalis scarioso-marginatis ciliatis, inferioribus 30–60 squamiformibus reniformibus, mediis 10–20 obovato-spathulatis, interioribus 15–20 demum oblongo-obovatis obtusis cuspidatis; petalis 20–30 oblanceolatis obtusis vel retusis denticulatis cuspidatis seu mucronatis sulphureis ima basi coccineis et sæpius dorso rubellis; stigmatibus 15–18 obtusis sulphureis patulis; bacca ovata squamosa viridi; seminibus globoso-obovatis hilo ovato subbasilari oblique excisis scrobiculatis lucidis. (Tab. XXI—XXIV.)

Var. *α.* CRASSISPINUS. E. flexispinus, *E. in Wisl. Rep.* non *Salm.*

Var. *β.* GRACILISPINUS: aculeis gracilioribus 16–20, exterioribus 12–14, centralibus 4–8, infimo elongato hamato. E. hamatocanthus, *Muehlenpf.*

Var. *γ.* BREVISPINUS: aculeis gracilioribus, radialibus 8–11, centralibus 4 teretibus cum infimo hamato radiales vix superantibus.

Along the middle course of the Rio Grande and near the Pecos and San Pedro rivers, on the mountains of the Limpia, and near Presidio del Norte, and southward into Mexico, but not as far west as El Paso, *Wright, Bigelow*: fl. June and July.—Heads ½ to 2 feet high, but flowering often when not more than two inches high. Ribs usually 13; areolæ roundish in younger, more elongated in older specimens, often only 6–10 lines, but in vigorous plants 1–1½ inch apart. Spines glabrous, or only the lower central one scabrous-pubescent; lateral spines whitish, all the others purplish or variegated, with paler semitransparent tips. The forms *β.* and *γ.* are those which occur in our territory; they differ in the length and number of spines, but not at all in flower and fruit. In Var. *β.* the lower and upper radial spines are 1–3 inches, the lateral ones 2–3½ inches long, upper central spines 2–5, and lower one 3–6½ inches long. Var. *γ.* is perhaps the young plant, as these plants often flower when yet quite young, and before the character of the mature plant is yet fully developed. This in a very marked degree is the case with *E. uncinatus*, var., which begins to bloom while the central spine is yet quite short and terete. Lower radial spines ½–1½ inch, upper ones 1½–2 inches long, lateral ones 1¼–1½ inch, and central spines all 1½–2 inches long. Flowers form a groove just above the spines, separated from the spiniferous areola by 2–5 obtuse cylindric glandular bodies which

often exude a clear viscous liquid. I find them also in *E. setispinus*, *E. Emoryi*, and numerous others, and they correspond, no doubt, with the glands in the groove of *Mamillaria Scheerii* and others. They appear with the flower, and are soft and fleshy at that time; afterwards they become hardened, of the texture of the spines themselves, and are persistent. Flowers 2½–3½ inches long, externally greenish-yellow and red, internally yellow, with a red base. Fruit 1–2 inches long, coated with 25 or 40 or more scales, crowded with the remains of the flower, green and very acid, (*Bigelow*,) or insipid or sweetish when fully ripe (*Parry*;) seed larger than in the last species 0.7–0.8 line in the longest diameter, deeply and distinctly pitted under the lens.

7. E. Wislizeni, E. in Wisl. Rep. has been often collected by the different gentlemen attached to the commission between Doña Ana and El Paso, and probably on the upper Gila, but not eastward. Small specimens show only 13 ribs; full-grown ones usually have 21 or even as many as 24 ribs; areolæ from ½ to 1½ inch distant from one another; on older plants closer than on half-grown ones; 3 lower radial spines annulated; stout, 8–20 lines long; 3 upper ones somewhat slenderer, but also annulated, 1½–2 inches long; in younger specimens these latter are wanting; in old ones they move more towards the centre of the areola, and become surrounded by the upper bristly spines. Lateral bristle-spines 15–20, 1½–2½ inches long, often twisted, spreading horizontally. All the stouter and annulated spines are red with paler semitransparent points; the weaker spines are yellowish-white. Ovary and fruit imbricately covered with 60 or 80 scales; fruit rather fleshy but not juicy, and soon hardening; seed oblique obovate 1.0–1.2 lines long; hilum small, broadly oval, subbasilar, or sometimes almost ventral; surface of the seed finely reticulated under the lens; curved foliaceous cotyledons partly buried in the large albumen. (Tab. XXV—XXVI.)

8. E. Le Contei, E. in Pacif. R. Report: This fine species, which was discovered by *Dr. Le Conte* on the lower Gila, and found again by *Dr. Bigelow* higher up on the Colorado, has been observed frequently by *Mr. Schott* in the western part of Sonora, where it flowers in August and September. The flowers, which had not been seen by any other observer, may be described thus:

Floribus plurimis subcentralibus; ovario squamis 30–50 sepaloideis reniformibus munito, sepalis tubi inferioribus 20–30 ovato-lanceolatis acutis ciliatis, superioribus 10–20 margine petaloideis obtusiusculis cuspidatis; petalis 20–30 lineari-spathulatis obtusis inciso-fimbriatis mucronatis sulphureis; tubo basi intus nudo; stylo stamina superante ad medium in stigmata sub-14 linearia fasciculata diviso. (Tab. XXVII.)

Mr. Schott's specimens were 3–4 feet high, clavate and usually only one-third as thick. Dr. Bigelow's specimens were not as slender. Flowers two inches in length, "somewhat campanulate," petals "lemon-yellow," with a brownish tint along the midrib; tube naked for about one line above the base of the style.

9. E. Emoryi, E. in Emory's Rep., 1848: grandis, ovatus, glaucescens; costis 13–21 rectis obliquisve obtusis tuberculatis; areolis ovatis junioribus dense sordideque tomentosis; aculeis 8–9 subæqualibus robustis subangulatis annulatis paulo recurvis rubellis demum fuscis apice sub pellucido corneis, radialibus 7 seu interdum adjecto (aculeo tenuiore summo) 8, lateralibus sublongioribus, centrali singulo recurvo seu subhamato paullo robustiore; floribus magnis purpureo-variegatis; sepalis ovarii 25 reniformibus ciliolatis, superioribus spathulatis lanceolatis

acutis; petalis sub-25 lanceolatis acuminatis versus apicem fimbriato-fissis; stylo stamina vix superante profunde 18–20-partito. (Tab. XXVIII.)

On the Gila, *Emory;* the lower Colorado, *Bigelow*; and in Sonora, at Punta de Agua, Sierra del Pajarito, Sierra de la Union and Sierra de Sonoyta, *Schott*: fl. in August and September.—Largest plants 30–36 inches high and 18–24 inches in diameter, with 20 or more ribs, smaller ones a foot in diameter, and globose, only 13-ribbed. Ribs strongly tuberculated, tubercles quite distinct, especially on the younger plants, and rounded, on old plants more confluent; areolæ 6–10 lines long, 1½–2 inches apart, oval, separated from the contiguous but smaller floral areola by 2–5 terete obtuse finally ligneous glands. Radial spines mostly 1–2 inches long, in a very large specimen from Guaymas, on the Gulf of California, procured by Dr. Bigelow, and now in the Congressional Garden in Washington, nearly 3 inches long; the 4 upper lateral spines are the longest and stoutest; the lower ones, and, if present, the uppermost radial spine, (in the specimen from Guaymas sometimes two), are shorter and slenderer than the others. Flowers aggregated near the vertex, about 3 inches long, dark brown purple outside; petals red, with yellowish margins; filaments rising from the thick and fleshy upper part of the short tube, leaving its lower part naked, extremely numerous; style thick, as long as the longer (exterior) stamina, divided to the middle into 18 or 20 filiform stigmata. Fruit and seed as yet unknown.

10. E. VIRIDESCENS, Nutt.: globosus seu depressus, simplex seu e basi ramosus; vertice depresso tomentoso; costis 13–21 compressis vix tuberculatis; areolis orbiculato-ovatis junioribus tomentosis; aculeis compressis annulatis plus minus curvatis e virescente rubellis, radialibus 9–13 (18–20, ex (*Parry*) infimo robusto breviore deorsum curvato, centralibus 4 robustioribus 4-angulatis compressis cruciatis, inferiore latiore longiore mimus curvato; floribus subverticalibus e flavo virescentibus; ovario globoso squamis sepaloideis 25–40 semilunatis reniformibusve denticulatis imbricatis stipato; sepalis tubi 25–30 ovatis oblongisve obtusis; petalis 20 oblongis obtusis eroso-denticulatis; stylo usque ad medium in stigmata 12–15 linearia erecta albida diviso; bacca ovata seu subglobosa squamata virescente floris rudimentis coronata; seminibus oblique obovatis dorso carinatis minutissime scrobiculatis, hilo orbiculato parvo subventrali. (Tab. XXIX.)

San Diego, California, on dry hills and ridges *Nuttall, Parry;* on the sea-beach, *Schott.* According to Nuttall this species is about 1 foot high, and has 9 or 10 inches diameter. Dr. Parry found them usually flat, 4 or 5 inches high (above ground) and 6–7 inches in diameter. They are usually simple, but sometimes, "only when wounded or burned over by fires," they branch from the base, forming in favorable situations quite a pile of prickly balls. In a young specimen brought home by Dr. Parry, about 2 inches in diameter, with 8 ribs, I find only 9 radial slightly recurved spines; the lowest and most curved one 4–6 lines long; the 2 upper ones 6–8 lines, and the 6 lateral ones 8–9 lines long; the 4 central spines are much stouter, more distinctly angular, compressed, and annulated, 10–16 lines long, the uppermost one more curved, the lowest one almost straight. Schott, in his notes made on the spot, states the number of radial spines to be 13, much shorter than the central spines; Parry describes the radial spines of the adult plant as 18–20, not more than 6–9 lines long, while the longest central spine is about 18 lines long. Flowers disposed in a circle around the vertex, greenish, 1½ inch long, 1¼ in diameter; tube inside naked at base; stamina short; style about one inch long, more deeply divided than in other species. Fruit 8–10 lines long, of the shape and taste of a gooseberry;

bluish-green in Parry's specimens, with 25–30, in Schott's with 35–40 scales; seed 0.8 lines long, very minutely but distinctly pitted.

11. E. CYLINDRACEUS, E. in Sillim. Journ., 1852, sub *E. viridescente:* ovatus seu ovato-cylindricus, simplex seu plerumque e basi ramosus; vertice breviter tomentello; costis 21 seu pluribus rectis seu obliquis obtuse tuberculatis; areolis ovatis; aculeis robustis compressis annulatis plus minus curvatis flexuosisve rubellis apice corneis, radialibus 12 sæpe cum aculeis gracilioribus sub-5 summæ areolæ insertis, lateralibus tenuioribus, infimo robusto breviori decurvato-hamato; aculeis centralibus 4 robustissimis 4-angulatis compressis cruciatis, superiore latiore sursum suberecto, inferiore deorsum curvato; flore flavo; bacca subglobosa carnosa pallide virescente sepalis semilunatis fimbriatis stipata, floris rudimentis coronata. (Tab. XXX.)

Rocky ravines near San Felipe, on the eastern slope of the California nmountains, in latitude 33°, *Dr. Parry;* also seen by *Dr. Le Conte.* Young plants globose, older ones ovate and cylindric; the former have 13 ribs, the latter from 20 to 27; the largest specimens seen were 3 feet high and a foot in diameter. They often branch out at base, which by Dr. Parry is ascribed to the action of fire, crippling the original stem. Ribs somewhat interruptedly tuberculated; tubercles flattened horizontally. In the youngest specimens are found already 7 radial and 4 central spines, the lower radial spine much the stoutest and quite curved, the 3 upper central spines almost radiating, the lower one erect, all stout, and 1–1½ inch long. In older specimens (the one before me is globose, 4 inches in diameter, with 13 ribs) the areolæ are 6–8 lines long, 3½–4 lines wide; the radial spines (together with the 3–5 slender additional ones on the upper edge of the areola) 12–18; the lowest one is stout and much hooked, and the shortest of all; the others are from 1½–2 inches long; the 4 central spines are 1–1½ line broad, and about 2 inches long; in the most fully developed bunches of spines the 3 upper radial spines are pushed into the inner circle, so that then the number of centrals appear to be 7. The upper central spine is the broadest one, almost straight and erect; the lower one has mostly a strong downward curve. The fruit is described by Dr. Parry as a green, juicy berry, about an inch in diameter, in the axils of the uppermost spines, with yellow remains of the corolla; seed black, "intermediate in size between that of *E. viridescens* and *E. Wislizeni.*" I was inclined to consider this plant as a form of *E. viridescens*, but Dr. Parry, who has seen numerous specimens of it, is satisfied that it is quite a distinct species. It is characterized by the cylindrical growth, more obtuse ribs, more numerous, longer, and more curved spines, of which the upper, not the lower one, is the largest and broadest. It is quite remarkable that we have three so similar species on both sides of the Californian mountains as the two just mentioned and *E. polycephalus;* the western one globose, the two eastern ones cylindrical and many-headed; these entirely dissimilar in flower and fruit, and one of the eastern and the western one so much alike. It is an interesting observation that similar but quite distinct species occur on both sides of the mountains, not only in this genus, but also in *Mamillaria* and *Opuntia;* and that no species crosses that mountain range.

12. E. POLYCEPHALUS, Engelm. and Bigelow, in Pacific Railroad Report, found by *Mr. Schott* on the Gila and lower Colorado. He notes the cæspitose growth, and the heads 5–8 inches in diameter, 10–15 inches long, with 10–15 ribs. *Dr. Bigelow's* specimens from the Mojave river were much larger, but the fruit sent by Mr. Schott leaves no doubt about their identity.

13. E. PARRYI (sp. nov.): simplex, globosus seu depressus; costis 13 acutis tuberculato-interruptis, sæpe obliquis; areolis orbiculatis, seu areola florifera contigua minore aucta, ovatis albo-

tomentosis; aculeis omnibus robustis angulatis plus minus compressis albidis, radialibus 8–11 rectis seu paullo curvatis, superioribus debilioribus, lateralibus robustioribus, infimo deficiente; aculeis centralibus 4 validioribus, 3 rectiusculis sursum versis, infimo valido longiore curvato deflexo; bacca sicca oblonga squamis aristatis spinescentibus tomentoque denso albo vestita floris rudimentis coronata. (Tab. XXXII, fig. 6–7.)

Desert region southwest of El Paso towards Lake Guzman, over an area of 60 or 80 miles in extent, found by *Parry* with old fruit in January, and by *Wright* and *Bigelow* without flower or fruit in April.—I have before me only a few bunches of spines; the other data are all obtained from Dr. Parry's notes. The plant is 8 or 12 inches high by 10 or 15 inches in diameter, always simple; the ribs interrupted; upper tubercles less distinct, flattened sidewise, lower older ones transverse and very distinct grooves between the ribs about an inch deep; areolæ of the spines ¼ inch in diameter, orbicular, or with the closely adjoining floriferous areola oval, about ¾ inch long. Radial spines in my specimen 8 or 9, "often as many as 11;" lower ones divergent; stoutest upper ones more slender. Central spines 4, stouter and 1½–2 inches long, somewhat bulbous at base, upper and lower one, especially the last, stoutest and longest.—This species is nearly allied to the last, but even in the absence of seeds we can distinguish it by the simple globose or somewhat depressed heads, and the white spines. I have named it after *Dr. C. C. Parry*, who by his intelligent observations and copious notes about the *Cactaceæ* of the Boundary has greatly assisted me in their elucidation.

14. E. HORIZONTHALONIUS, Lemaire, var. CENTRISPINUS: glaucus, depresso-globosus (vetustus saepius ovatus umbilicatus); costis 8 obtusissimis latissimis; sinubus superficialibus acutis; tuberculis sulco transverso inconspicuo vix distinctis; areolis orbiculatis basi truncatis prominulis, junioribus albo-lanatis; aculeis 6–8 robustis compressis annulatis recurvatis rubellis demum cinereis, radialibus 5–7, superioribus debilioribus, infimo deficiente, centrali singulo robustiore latiore deorsum flexo; floribus ex vertice densissime lanato centralibus campanulatis; ovario tuboque lana longa dense vestito; sepalis exterioribus 60–70 subulatis linearibus et lanceolato-linearibus spinoso-aristatis atropurpureis nudis ex lana copiosissima axillari vix exsertis; sepalis interioribus sub-15 obovato-lanceolatis mucronatis axilla nudis; petalis sub-36 oblongis obtusis eroso-dentatis roseo-purpureis; stylo supra stamina numerosissima flava exserto rubello; stigmatibus 6–8 brevibus erecto-patulis; bacca rubra succosa mox desiccata lana densa involuta floris rudimentis spinescentibus coronata a basi fere persistente circumscissa decidua; seminibus subglobosis rugosis minutissime tuberculatis nigris opacis, hilo transverso ventrali; embryone exalbuminoso suberecto clavato; cotyledonibus brevissimis. (Tab. XXXI, Tab. XXXII, fig. 1–5.)

Stony soil on the summit of hills, from the Pecos to El Paso, and north to Doña Ana, *Wislizenus*, *Wright*, *Bigelow*, *Parry*: fl. April and May, and "continuing to put out its beautiful flowers till July."—Easily distinguished by the broad obtuse ribs. The numerous specimens examined by me are all depressed, 1½–4 inches high and 2½–6 inches in diameter; but old specimens are said to be sometimes 6–8 inches high, oblong, and even cylindric; ribs in very young specimens 5, in all the flowering plants which I have seen, 8, and "sometimes 10"; in young plants the ribs are scarcely interrupted, but in older ones they are divided by more or less shallow grooves into very broad tubercles; areolæ 6–10 lines apart, covered with long wool when young; spines mostly 6–8, rarely 9, ¾–1½ inch (and usually 1 inch) long, nearly equal in length, very variable in shape and thickness, sometimes long and slender and almost terete;

in other specimens short, stout, and broad; flower 2½ inches long, of the same diameter, open only in bright sunshine, light purple or pink; tube lighter colored; ovary very short (3 lines), globose, tips of sepals dark purple, protruding from the dense white wool which envelops the whole flower; stamens of a flower counted by Mr. Wright, 1266; berry juicy, but drying up very soon, and finally breaking off transversely, leaving the base with most of the seeds hidden in the thick wool. The seeds, even when fully ripe, look shrivelled, and are 1.2–1.5 line long; the large circular (or rather truncate and transverse) hilum is deeply immersed; embryo almost without albumen, and quite straight, with thick, very short, erect cotyledons, and a taper-pointed radicle.—Our plant seems to be a variety of *E. horizonthalonius*, which is described as having 7 straight radial spines, the lowest one a little longer than the others, and the flower pale rose-colored, with lanceolate-acuminate petals. Prince Salm's var. *β. curvispinus* seems still nearer to our plant, which has a decidedly central but no lower radial spine, just like the last and the next species; the space for the lower radial spine is covered and filled by the strongly deflexed central spine.

15. E. Texensis, Hoepf. Not observed farther west than the San Pedro and Pecos rivers. Fruit red and juicy, drying up very soon; seeds 1.2–1.4 line long, somewhat reniform, with a deep indentation including the circular hilum; testa smooth and shining, rarely (in Berlander's specimens from Matamoras, named by him *Melocactus laciniatus*,) indistinctly tuberculated; embryo curved or hooked, with the foliaceous cotyledons buried in the large albumen. (Tab. XXXIII.)

16. E. bicolor, Galeotti, var. Schottii: simplex, ovatus vel ovato-cylindricus; costis 8 obtusis tuberculatis interruptis; areolis orbiculatis; aculeis radialibus 15–17 rectis, inferioribus brevioribus teretiusculis basi bulbosis rubellis variegatis, summis 2–4 longioribus latioribus compressis albidis; aculeis centralibus 4 albidis, summo latiore longiore supra plano infra carinato recto seu paullo sursum curvato, cæteris compressis seu subteretibus brevioribus rectis; floribus magnis in vertice tomentoso subcentralibus; ovario squamis sepaloideis 10–12 reniformibus margine ciliatis imbricato, sepalis tubi 40 sensim majoribus obtusis margine pallidiore ciliatis, summis oblongis; petalis purpureis; stigmatibus 8 suberectis.

On cretaceous hills, covered with chapparal, (thorny bushes,) near Mier, on the lower Rio Grande, *Schott*: in flower in September.—Stem 4–6 inches high, 2–3 in diameter; grooves rather shallow; floral areola close to the spiniferous one, without the intervening glands which are so conspicuous in *E. longehamatus* and others, and which I find also in the Mexican forms of *E. bicolor*. The 4 upper radial spines about an inch long and flat; all the others rounded, red, paler at both ends; the lowest is the weakest and shortest one, and often somewhat curved; upper central spine 15–20 lines long; the 3 others shorter; the lower one flat above, rounded below, often reddish like the lower radial spines; flower between 2 and 3 inches long; petals bright-purple or rose-purple, gradually paler in fading; filaments springing from the whole tube down to its base. The original Mexican *E. bicolor* is distinguished by the more globose form, also by the smaller number of radial spines, (10–11,) and by the upper central spine not being carinate nor longer than the others.

17. E. intertextus, (sp. nov.): minor, ovato-globosus; costis 13 acutis interruptis subobliquis; tuberculis supra breviter tomentoso-sulcatis; areolis ovatis (in planta juniore angustioribus) approximatis; aculeis brevibus rigidis e basi albida rubellis apice fuscatis, radialibus

16–25 arcte adpressis intertextis superioribus 5–9 setaceis albidis rectis, lateralibus rigidioribus paulo longioribus infimoque robusto brevi sæpe paullo recurvatis; aculeis centralibus 4, superioribus radiales excedentibus sursum versis, inferiore brevissimo porrecto robusto; floribus parvis in vertice dense lanato congestis purpurascentibus; ovario brevissimo 5–6-squamato; sepalis tubi 20 late ovatis cuspidatis albo-marginatis; petalis 20–25 oblongis mucronatis; stylo stamina numerosissima vix superante; stigmatibus 7–8 purpureis erectis; bacca globosa sicca squamis evanescentibus subnuda basi subpersistente circumscissa; seminibus reniformibus circa hilum magnum orbiculare ventrale curvatis tenuiter verruculosis lucidis; albumine parco; embryone curvato; cotyledonibus foliaceis brevibus. (Tab. XXXIV.)

Var. β. DASYACANTHUS: ovatus seu conoideus; aculeis gracilibus longioribus e purpurascente cæsiis, radialibus 19–25 setaceis pluriserialibus, superioribus 7–9 gracilioribus brevioribus albidis fasciculatis, centralibus 4 vix robustioribus, superioribus 3 sursum versis reliquos excedentibus, inferiore porrecto paullo breviore. (Tab. XXXV, fig. 1–5.)

On stony ridges from the Limpia to El Paso, *Wright*, *Bigelow*, and westward, *Parry*; also towards Chihuahua, *Wislizenus*; var. β. common about El Paso: fl. March and April.—Stems 1–4 inches high, and a little less in diameter; areolæ 3 or 4 lines apart; upper setaceous spines pale, 2½–6 lines long, lateral spines 4–7 lines, lowest only 2–4 lines long; upper central spines 5—7 and even 9 lines, lower one 1 or rarely 2 lines long; in young plants the 13–15 radiating spines are more equal in length, and several or all of the central spines are wanting. Flowers about an inch long and wide; sepals dark purple with paler margins; petals similar, outer ones deeper, inner ones gradually lighter colored; stamens more than 650, half as long as petals. Fruit about 4 lines in diameter, tipped by the withered flower, usually with a few dry scales, with or without some wool in their axils; the base usually persistent for some time, while the upper part comes off, separating more or less regularly. Seeds nearly or quite one line long, with a very large hilum.

Var. β. has the flowers and fruit of var. α, but is a larger plant with much longer and slenderer spines, lower central spine almost as long as the others. Spines in var. α. appressed so that the plant resembles somewhat, and has been confounded with, *Cereus viridiflorus*. In var. β. the spines are loosely patulous, forming a tuft on the top; the whole plant is very similar to *Mam. dasyacantha*; the entire similarity of flower and fruit, and the intermediate forms of the spines, leave no doubt of both plants belonging together, though their external appearance is so very dissimilar.

III. CEREUS, Haw.

Subgen. 1. ECHINOCEREUS, E.*

1. C. VIRIDIFLORUS, E. in Wisl. Rep. β. CYLINDRICUS: ovatus seu plerumque cylindricus, subsimplex; costis sub-13 acutis fere interruptis; areolis confertis ovatis seu ovato-lanceolatis,

* This subgenus, which was indicated by me in the Appendix to Wislizenus' Report as a genus distinct from *Cereus*, and which Prince Salm in the latest edition of his *Hortus Dyckensis* very properly reduced to a section of that genus, is well characterized by the peculiarities of the flower and fruit pointed out in the work above mentioned. The numerous species since discovered confirm this character. The seeds, especially, are distinct from those of any other *Cactaceæ* examined by me. They are rather small, never so much as one line (between 0.4 and 0.9 line) in length, obliquely obovate or subglobose, more or less compressed, and with a circular or oblong basilar or sub-basilar hilum; testa black, hard, and brittle, always tuberculated; its tubercles large or small, equal or unequal, distinct or more or less confluent, and then leaving irregular depressions, so that the seed appears pitted or pitted and tubercled together. Embryo with little or no albumen, almost straight, or very slightly curved the short though distinct, and even somewhat foliaceous, transverse cotyledons more or less bent, inclined to form a hook.

junioribus albo-villosis mox denudatis*; aculeis 12–18 radialibus brevibus pectinatis rigidis, adjectis plerumque supra aculeis adventitiis 2–6 brevioribus setaceis, lateralibus longioribus, inferioribus purpureis demum fuscis, superioribus plerumque albidis, rarius omnibus purpureis; aculeis centralibus nullis seu rare singulo robusto recto vel subinde curvato apice seu toto purpureo-fusco, rarissime altero graciliore superiore adjecto; floribus versus apicem lateralibus e flavo virescentibus; ovario tuboque pulvillos 25–30 (aculeolis infra 8–12, supra 3–5 albidis seu rubellis munitos) gerentibus; sepalis interioribus lineari-oblongis 10–15 virescentibus fuscatis; petalis 12–15 lineari-oblongis acutiusculis; baccis ellipticis virescentibus; seminibus parvis obovato-subglobosis tuberculatis, hilo basilari suborbiculato. (Tab. XXXVI.)

On the Limpia, and thence towards El Paso, *Wright*: fl. in May.—This is a taller form than the original species described in Wislizenus' Report, from the northern parts of New Mexico, with stouter spines and acute petals. A handsome plant, not so much on account of the inconspicuous flowers, as from the beauty of the purple and white spines, which are particularly bright when first developed in spring, and look like flowers. Stems 3–6 and sometimes even 8 inches high, 1–2 inches in diameter; spines usually 3–5 or nearly 6 lines long; central spines, if present, 6–10 lines in length, more common on the smaller northern var. α., rarely present in the southern form. In a single specimen collected by *Dr. Bigelow* on the upper Pecos, I find on some of the areolæ all or most of the spines purple, and the central spine sometimes curved upwards, sometimes white, with a purple tip, or purple to the base. Flower one inch or less below the top, 1–1½ inch long, not quite as wide even when fully open; petals 2–3 lines wide. Fruit 5–6 lines long, crowned with the withered corolla, as in all *Echinocerei;* in some rather dry fruits the corolla is quite persistent; in the more juicy ones it, as well as the spines on the fruit, are deciduous when the fruit is quite ripe. Seed 0.5–0.6 line long, tuberculated, but the tubercles somewhat confluent, very slightly in the northern form, a little more in ours, so as to show pits between the warts; seed somewhat compressed, and keeled on the back.

2. C. CHLORANTHUS (sp. nov.): cylindricus, simplex seu e basi parce ramosus; costis 13–18 subinterruptis; areolis confertis orbiculato-ovatis; aculeis 12–20 laxius radiantibus setiformibus albis, lateralibus longioribus apice sæpe purpurascentibus, adjectis supra aculeolis 5–10 brevioribus setaceis; aculeis centralibus 3–5 quorum 2 superiores breviores plerumque purpurascentes sursum divergentes, 1–3 inferiores longiores divergentes deflexique albidi; floribus in caule medio vel inferiore lateralibus virescentibus extus rufis; ovario pulvillos sub-21 (aculeolis 14–18 setaceis munitos) gerente; sepalis tubi sub-18 lineari-lanceolatis, inferioribus aculeolos axillares 3–5 gerentibus; petalis 15–18 lineari-oblongis mucronatis; filamentis styloque sulphureis; stigmatibus 8–11 viridibus adpressis; bacca subglobosa aculeolata; seminibus parvulis tuberculato-scorbiculatis. (Tab. XXXVII—XXXVIII.)

Common on stony hills and mountain sides near El Paso, *Wright, Bigelow,*: fl. April.—Stems 3–9 or 10 inches high, 1½–2 inches in diameter; areolæ 3 or 4 lines apart, not so much elongated as in the last species, and often almost orbicular; radial spines slender, patulous, not strictly radiating, pectinate or adpressed to the plant; lower lateral ones the longest, as in all these *Pectinati*, 4–5 lines long, inferior ones shorter, upper ones shortest; no

* This *tomentum* or *villus* on the young or nascent areola is so universally present, always disappearing with age, that it ceases to be a character. The differences consist only in the greater density or looseness of this tomentum, and in its color, which is almost always white, but occasionally yellowish, gray, tawny, brown, or almost black. I shall only make mention of it where it varies from the ordinary form.

central spines are present in young plants, next 1–3 appear, and well developed flower-bearing plants have always 5; the upper darker and shorter ones are about 6 lines, the lower ones 9–12 or even 15 lines long; the lowest one is the longest and regularly deflexed, so that the plant seen from above shows as many rays, formed by these spines, as there are ribs. Spines mostly white, the lower lateral and central ones often tipped with purple, upper central ones entirely purple; a specimen has been sent with all the spines almost entirely white. Flowers yellowish-green, always low down on the plant, (usually below the middle, often in the lower third) forming a circle around the stem; flowers an inch long, funnel-shaped, not fully opening even in bright sunshine. Mr. Wright, to whose careful examinations and full notes I am indebted for many data, found the stamina about 400 in number, and half as long as the petals; stigmata green, much exsert. Fruit half an inch or less in thickness, crowned with the conic remains of the flower; seed 0.5 or 0.6 line in diameter, orbicular, compressed and carinate; tubercles confluent, so as to form pits; hilum linear-oblong or oval, basilar. Name from the color of the flowers.

3. C. DASYACANTHUS, E. in Wisl. Rep.: ovatus seu subcylindricus, simplex seu e basi parce ramosus, subcæspitosus; costis 15–21 rectis seu obliquis subinterruptis; areolis confertis ovatis; aculeis 20–30 rectis rigidis patulis stellatim undique porrectis intertextis cinereis apice sæpe rubellis vel adustis, in plantis debilioribus albidis, exterioribus 16–24 quorum laterales longiores, superiores breves graciles, inferiores intermedii, interioribus 3–8 robustioribus; floribus sub vertice ipso subterminalibus magnis flavis; ovarii pulvillis 35–45 villosis aculeolos 15–18 albidos seu apice rubellos gerentibus; sepalis tubi late campanulati inferioribus 20–30 aculeoliferis, superioribus 15–20 petaloideis oblanceolatis acutis seu cuspidatis; petalis 15–25 spathulato-oblanceolatis mucronatis seu interioribus plerumque obtusis muticis; staminibus numerosissimis; stylo exserto subclavato; stigmatibus 13–18 viridibus erectis; bacca magna subglobosa aculeolata; seminibus subglobosis tuberculatis. (Tab. XXXIX, XL, et XLI, fig. 1.)

About El Paso, and down to the cañon of the Rio Grande; common on rocky hills and the edge of gravelly table-lands, where *Dr. Wislizenus* first found it in 1846, and where the gentlemen connected with the Boundary Commission have since abundantly collected it in flower and fruit, and in numerous living specimens.—The geographical range of this species seems quite limited, as it has not been sent from any other locality but the one indicated. Fl. in April and May; fr. ripe in June.—Stems 5–12 inches high, 2 or 3 or even 4 inches in diameter, densely covered by the innumerable ashy-grey or reddish spines; lower lateral spines somewhat bulbous and compressed at base, 6–7 lines long, upper ones 3–4 lines, and lower ones about 5 lines long; upper central spines shorter than the lower ones, these are the stoutest and of about the length of the lower external spines, or a little longer. Flowers large and numerous, from the upper axillæ of the past year's growth, before the growth of the same spring is much advanced, so that they appear terminal or central at first glance, as they cover the top of the plant; this is the case with many spring-flowering *Echinocerei*; others, (e. g. the last mentioned species,) produce their flowers lower down on the plant from older axillæ. Flower 3 inches or more in length, and of the same diameter, very showy, externally greenish yellow, with the centre of sepals red; petals bright yellow; stamens counted by *Mr. Wright*, over 1700, with yellowish green filaments; pistil stout; stigmata thick, erect. Flower (like those of most *Echinocerei*) open in bright sunshine only, about the middle of the day, closing in the afternoon, but reopening the next, or even the third day, unless the weather be very hot, when all the functions of the

flower are performed in one day. Fruit subglobose, 1–1½ inch in diameter, green or greenish purple, when fully ripe "delicious to eat, much like a gooseberry." Seeds 0.6 line long, subglobose, very little oblique, with an oblong basilar hilum, strongly and distinctly tuberculated, like those of *C. cæspitosus;* embryo almost straight, or rather the cotyledons slightly bent forward.

4. C. CTENOIDES (sp. nov.): subsimplex, ovatus; costis 15–16 obliquis subinterruptis; areolis lanceolatis confertis; aculeis rigidis albidis demum cinereis intertextis, radialibus 14–22 pectinatis basi bulbosa lateraliter compressis arcte adpressis sæpe subrecurvis, lateralibus longioribus, summis brevissimis, centralibus 2–3 raro 4 uniseriatis abbreviatis robustis basi bulbosis; floribus versus apicem lateralibus campanulatis flavis; ovarii ovati pulvillis sub-40 aculeolos 12–16 breves setaceos albidos seu apice fuscatos gerentibus; tubi campanulati sepalis inferioribus 30 squamiformibus ad axillas setis 3–10 munitis, sepalis interioribus 12–15 lanceolatis acutis intimis obtusis, omnibus mucronatis; petalis 25–30 spathulatis obtusis retusis vel obcordatis denticulatis flavis basi angustata virescentibus; filamentis numerosissimis virescentibus brevibus; stylo albido; stigmatibus 10–12 obtusis erecto-patulis viridibus. (Tab. XLII.)

From Eagle Pass to Santa Rosa, *Bigelow*; on the Pecos, *Wright*; fl. June and July (in St. Louis).—Stems 2–4 inches high, 1½–2½ inches in diameter; aspect of plant very similar to *C. pectinatus*, to which I allude by the Greek name, of the same meaning. Areolæ about one line long, also about one line apart; spines whitish or ashy, and in some specimens with light brown tips; sometimes I find only 14–16 radial spines, (1 upper, 1 lower, and 6–7 pairs of lateral ones); the older and larger ones have 7–9 pairs of lateral spines, 1 lower one, and often 3–5 small bristly upper spines. Upper spines ½–1 line, lower one 1—2 lines, and the others 3–4 lines long. Central spines in a single longitudinal series one above the other, 1–3 lines long. Flower bright yellow, with a light green centre and dark green stigmata, open from 8 or 9 till one o'clock, 2½–3½ inches long, 2½–3½ inches in diameter, the broad and obtuse petals forming an even uninterrupted margin all around. Ovary with 38–44 pulvilli, scales obsolete, wool short, bristles about 15 in each bunch, 2–3 lines long. Pulvilli of tube 25–35, with green fleshy sepals, the lower ones with 8–10 short, and the upper ones with 3–4 longer (5–6 lines long) bristles; petals 1½–1¾ inch long, ½ inch wide, lower part of the tube narrow, and for about 1½ line naked inside; filaments very numerous and very slender; anthers small pale yellow; stigmata rather slender, 3 lines long. Our plant looks distinct enough from *C. dasyacanthus*, which is taller, has a larger number of ribs, rounder and shorter areolæ, patulous and usually more numerous spines, and more and longer central ones, also flowers almost vertical, with stouter spines on their tube; but it may, after all, be only a form of it, just as *Echinocactus intertextus* and *E. dasyacanthus* belong together, and as *C. viridiflorus* and *C. chloranthus* may be joined; intermediate forms, however, have not yet been observed. It has already been stated that the flowerless plant so closely resembles *C. pectinatus* that it can hardly be distinguished from it except by the fewer ribs; the color of the flowers, to be sure, is very different, but, though no instance is yet known among *Cerei* where yellow and purple flowers are found in the same species, this may not be impossible, and we may possibly have to unite all these forms.

5. C. PECTINATUS, E., var.? RIGIDISSIMUS: ovato-cylindricus; costis 20–22 interruptis; areolis lineari-lanceolatis confertissimis, junioribus parce lanosis; aculeis omnibus radiantibus arcte adpressis subrecurvis e basi bulbosa subulatis acutissimis rigidissimis albidis flavidis rubellisve subpellucidis, lateralibus 12–16 longioribus robustioribus, infimo singulo vix breviore,

superioribus 3–6 setaceis brevibus fasciculatis; floribus sub vertice lateralibus; ovarii pulvillis 50–60 aculeolos 8–12 rigidos gerentibus; sepalis tubi 40 inferioribus subulatis ad axillam aculeiferis, superioribus 20 lanceolatis acuminatis; petalis sub-20 spathulatis acutiusculis incisoto-dentatis purpureis; stigmatibus sub-12; bacca ovato-globosa aculeolata; seminibus tuberculatis.

In the Sierras of Pimeria Alta in Sonora, and farther west, *A. Schott*: fl. June and July.—Stems 4–8 inches high, 2 inches in diameter; areolæ 2–2½ lines long in the larger full-grown specimens, 3 or 4 within one inch of the rib; in a small specimen, with only 15 ribs, smaller areolæ and smaller and more numerous spines (30–35, only 1–1½ line long); 12 or more bunches of spines are crowded within the same space. Spines all radiating and interlocking, extremely rigid and acute, variegated, the latest ones of each season being rose-colored, and the earliest ones a pale yellowish, thus forming variegated rings around the stem. Lateral spines 3–4½ lines long, lower one 2 lines long, upper ones still shorter. Flowers near the depressed vertex, just on the outer edge of the rounded top, 2½–3 inches long, bright pink, or purple. Fruit subglobose, nearly an inch long, pulpy and edible; the fleshy part of the stem is also eaten by the inhabitants, who call this plant "Cabeza del Viejo." Seed (not quite ripe) 6 lines long, strongly tuberculated, closely resembling that of *C. cæspitosus*. I can distinguish this plant from *C. pectinatus* only by the greater rigidity and thickness of the radial, and the entire absence of the central spines. The forms allied to *C. pectinatus* are very difficult to distinguish, and it is quite probable that they may run into one another, as Dr. Poselger, who has seen thousands of them in Texas and Northern Mexico, is inclined to think. I find that *C. pectinatus* has always a distinct single inferior spine, which is only a little shorter than the lower lateral spines; while *C. cæspitosus* has generally several of the lowest spines much shorter and weaker than the lateral ones. *C. adustus*, the flower of which is not yet known, has fewer ribs, oval areolæ, and the lowest spine much as in *C. pectinatus*.

6. C. CÆSPITOSUS, E. in Pl. Lindh., which extends from the Arkansas river to Saltillo, has been found by *Mr. Wright* as far west as the Nueces and the San Pedro. The loose darkish wool and slender bristles on the extremely numerous (80–100) pulvilli of the flower-tube, and especially the position of these pulvilli,—not in the axil, but considerably above it on the sepal, just below its foliaceous tip,—distinguish this species from the nearly allied *C. pectinatus*, as well as from all other *Echinocerei* known to me. This structure of the sepals seems to imitate and explain the morphology of the tubercles in *Mamillaria*, demonstrating them not to be a branch or an axis, but the fleshy petiole of an abortive or depauperate leaf, which sometimes is indicated by an indistinct scale above the fasciculus of spines, or by the point of the tubercle of an *Anhalonium*. This species has 12–18 ribs, 20–30 radial spines, rarely with 1 or 2 central ones here and there; flower 2–3 inches in diameter; petals sometimes, though rarely, curly, as in our figure, mostly plain; stigmata 12–18; fruit 9–10 lines long, oval, generally bursting irregularly; seed 0.6–0.7 line long, obovate, oblique, sometimes almost globose, very strongly tuberculated, with an oval hilum. The name *C. cæspitosus*, which would apply much better to a number of other species of this section, was given before any of these were known; it not inaptly represents a common state of the plant when it makes 5–12 heads, but not rarely it is almost or quite simple. (Tab. XXXIII—XXXIV.)

7. C. [illegible] (sp. nov.): subsimplex, ovato-cylindricus; costis 11–14 interruptis tuberculatis; areolis orbiculatis; aculeis setaceis flexilibus albis patulis radialibus 18–20 centis basi

bulbosa compressis, superioribus tenuioribus brevioribus, inferioribus longioribus, centralibus 5–7 bulbosis, quorum superiores radialibus vix longiores, 1–3 inferiores elongati divaricati deflexi sæpe flexuosi. (Tab. XLV.)

Mountains about Santa Rosa, in Coahuila, *Bigelow*.—Stems simple, or somewhat branching at base, 2–3 inches in diameter, 6–9 inches high; ribs fewer, more distinctly tuberculated, and less compressed than in most other species, and easily distinguished thereby. and by the orbicular areolæ, from the otherwise similar-looking, pale-spined forms of *C. chloranthus*. Upper radial spines 2½–3 lines, lowest and lateral ones 6–7 lines long; upper central spines hardly longer than these; lower central ones always 3 in well-developed plants, 1½–2 or even 2½ inches long. Flower and fruit of this peculiar and pretty plant as yet unknown; the former said to be red. Name from the length and slenderness of the spines.

8. C. Rœtteri, (sp. nov.): ovato-cylindricus; costis 10–13 interruptis; areolis ovato-orbiculatis subconfertis; aculeis e basi bulbosa subulatis rubellis apice obscuris demum cinereis, exterioribus 8–15 additis sæpe supra aculeis centralibus, lateralibus longioribus, infimo singulo breviore; aculeis centralibus 2–5 robustioribus plerumque sub-brevioribus; floribus sub vertice lateralibus magnis purpureis; ovarii pulvillis 20–24 aculeolos 10–15 albidos fuscatosve gerentibus; sepalis tubi inferioribus aculeoligeris sub-15 triangulari-lanceolatis, superioribus 8–10 oblanceolatis spathulatis; petalis 8–12 spathulatis; tubo intus basi nudo; stigmatibus 10–12 viridibus suberectis stamina numerosissima brevia longe superantibus; bacca subglobosa; seminibus oblique obovatis compressis inæqualiter tuberculatis subscrobiculatisque, hilo basilari parvo oblongo. (Tab. XLI, fig.3–5.)

Sand-hills south of El Paso, *Bigelow;* near El Paso or Frontera, *Wright:* fl. April.—A single living specimen, preserved in the Congressional Garden in Washington, is 5 inches high and 2½ in diameter, and has 12 ribs; areolæ in this and the dried specimens are 4–6 lines apart; lower lateral spines 5–7 or 8 lines long, lowest one a little shorter, upper ones 2–3 lines in length; central spines usually only 4–6 lines long, rarely one or the other longer; always stouter than the others, and with very thick and bulbous bases. Flowers 2½–3 inches long, purple, very similar to the flower of *C. Fendleri* or *C. enneacanthus;* fruit 8–10 lines long, and rather less in diameter; seeds 0.7 line long, strongly but irregularly tuberculated; tubercles here and there somewhat confluent. In the arrangement of its spines this species considerably resembles *C. dasyacanthus*, and I have formerly taken it for a smaller variety of that species; but it differs from it by the smaller number of ribs, the fewer and stouter spines, which place it almost intermediate between the *Pectinati* and the *Decalophi*, the red flower, the small fruit, and the larger and irregularly tuberculated seed. I take great pleasure to acknowledge my indebtedness to the modest and faithful artist, *Mr. Paulus Rœtter*, who has adorned this memoir by his skillful pencil, by naming this species after him.

9. C. Fendleri, E. in Pl. Fendl.: simplex, seu parce e basi ramosus, ovatus seu ovato-cylindricus, perviridis; costis 9–12 rectis seu obliquis tuberculato-interruptis; areolis orbiculatis, junioribus dense tomentosis subconfertis; aculeis basi bulbosis, radialibus 7–10 rectis seu sæpe curvatis, inferioribus robustioribus, infimo 4-angulato albido, sequentibus 2 obscuris, cæteris albidis seu sæpius fusco-variegatis, superioribus tenuioribus pallidis, summo deficiente seu robusto elongato curvato; aculeo centrali valde bulboso teretiusculo elongato fusco-atro sursum curvato rarissime deficiente; floribus magnis purpureis subverticalibus; ovarii tubique pulvillis 25–35 aculeolos 3–12 albos sæpe adustos gerentibus; sepalis interioribus 12–15 lineari-

lanceolatis seu spathulatis acutis seu cuspidatis; petalis 16–24 oblongo-linearibus seu obovato-spathulatis acutis seu obtusis mucronatis sæpe eroso-denticulatis; stigmatibus 12–16 stamina numerosissima vix superantibus erectis; bacca ovato-globosa ex viridi purpurascente pulvillis aculeolatis 18–20 stipata; seminibus oblique obovatis curvatis paullo compressis scrobiculatis (tuberculis irregulariter confluentibus,) hilo ovato seu subcirculari basilari; embryone paullo curvato.

In various situations, among rocks or in alluvial river-bottoms from Santa Fé, *Fendler;* to the cañon of the Rio Grande below El Paso, *Wright, Bigelow;* and from the country fifty miles east of the Upper Pecos westward to Zuñi and the Aztec mountains, *Bigelow*, and to the Copper mines, *Thurber:* fl. May and June.—Stems single or few together, 3–8 inches high, 2–3 inches in diameter, not many together, and those usually of unequal height, not level-topped, like *C. phœniceus* and others; areolæ 4–7 lines apart; spines very variable, but always characterized by their bulbous base, by the lower ones being stouter and longer than the upper ones, partly white and dark, and by the long and dark central spine, which is always curved upwards. Radial spines mostly 7, a white and angular one below, 6–12 lines long; the two next ones hardly longer, more terete, black on the upper and usually white on the lower surface; then comes a pair of white or rarely variegated spines, scarcely shorter, above them two weaker, whiter, and shorter spines, 3–6 or 7 lines long. This is the usual form, especially in the north; often, however, two more upper spines are found, and sometimes a slender, or oftener a stout and dark-colored spine, not rarely 12–15 lines long, is placed on the upper edge of the areola, similar to, but always smaller than, the central spine. All these forms are occasionally seen on the same specimen. In some southern specimens I observe now and then a few small additional upper spines. The form which I have described in *Pl. Fendlerianæ* as *β. pauperculus*, and which *Dr. Bigelow* collected also on the Pecos, has mostly only six spines: five lower and lateral radial ones and the central one, which, more or less, assumes the place of the absent upper radial spine. This, however, is not a constant form, as transitions to the usual arrangement of spines are often seen on the same specimen. Central spine very much thickened at base, almost terete, black, often with a lighter tip, curved upwards, 1–2 inches long. Flower 2½–3½ inches long and wide, not fully open before noon, closing again after 2 o'clock; spines on the ovary 2½–4, on the upper part of the tube 4–8 lines long, distinctly bulbous at base, and often angular; petals 4–7 lines wide, acute or obtusish; stamina about 1600 in a specimen examined by *Mr. Wright*, only from the upper and wider part of the tube, the lower and narrow part 3–4 lines long, naked. Fruit 1–1½ inches long, purplish-green, edible; seeds 0.7 line long, very oblique, irregularly pitted by the tubercles, as it were, running together in twisted lines.

10. C. ENNEACANTHUS, E. in Wisl. Rep.: ovato-cylindricus, obtusus, læte viridis, simplex seu plerumque dense cæspitosus; costis 7–10 obtusis infra dilatatis sursum compressis tuberculatis sulco transverso sæpe interruptis, sinubus profundis acutis; areolis orbiculatis remotis; aculeis rectis, radialibus 7–12 (plerumque 8) albis subpellucidis, inferioribus longioribus, centrali singulo (raro 2 superioribus tenuioribus additis) basi bulboso teretiusculo seu plerumque plus minus compresso triangulatoque albido stramineo seu obscuriore radialibus longiore; floribus subterminalibus seu lateralibus; ovarii pulvillis 25–35 in squamæ triangularis axillis villosis aculeolos 6–12 albidos seu fuscatos gerentibus; sepalis tubi inferioribus 18–20 cum aculeolis longioribus paucioribus, superioribus 10–18 oblanceolatis acutis; petalis 12–15 oblongo-obovatis erosis obtusis acutisve; stigmatibus 8–10 viridibus elongatis erectiusculis; bacca

subglobosa e purpureo virescente; seminibus minutis obovatis subobliquis tuberculatis, hilo oblongo. (Tab. XLVIII, fig. 2–4, and tab. XLIX.)

Along the Rio Grande, from El Paso, *Wright*, *Parry*, to Eagle Pass, *Schott*, *Bigelow*, and into Mexico, *Wislizenus:* fl. April and May. A widespread species, assuming many forms, sometimes approaching the next. Stems generally branching and cæspitose, 3–6 inches high, 1½–2 or 2½ inches in diameter, fresh green, in winter often reddish; even when in full growth appearing flaccid or shrivelled. Areolæ 6–10 lines apart; spines remarkably transparent, much smaller on the lower part of the plant than on the upper one, all bulbose at base, especially the central ones. Upper radial spines 3–5 lines, lateral ones 5–12 lines, lower ones 8–16 lines long, all usually less than one inch. In some specimens the radial spines are almost equal in length; in others they differ very much. Central spine extremely variable in color, size and shape; when young usually yellowish or brownish, at last ash-colored; in younger plants terete; in perfectly developed ones triangular and flattened, 8 or 10 to 15 or 20 lines long; sometimes we find one or two additional shorter and angular central spines above the principal one, diverging upwards. Flowers 2–3 inches long, and of the same and even greater width when fully open; the smallest were obtained at Eagle Pass, bright purplish-red; these have more numerous as well as slenderer and shorter spines on the ovary, and bloom earlier; the larger flowers come from El Paso and Chihuahua, from larger plants with longer spines. Berry 10 or 12 lines long, greenish or purplish, pleasant to eat; seed 0.5 line or less in the longest diameter, its tubercles very prominent and distinct.

11. C. STRAMINEUS, (sp. nov.): ovato-cylindricus, versus apicem attenuatus, læte viridis, cæspitosus densissimeque agglomeratus; costis 11–13 sursum compressis obtusis tuberculatis transverse sulcatis; areolis orbiculatis remotis; aculeis radialibus 7–10 (plerumque 8) rectis seu paullo curvatis basi bulbosis teretibus seu inferioribus subinde angulatis albis subpellucidis subæqualibus; aculeis centralibus subquaternis basi bulbosis angulatis elongatis radiales longe excedentibus sæpe flexuosis stramineis fuscatis, nascentibus sæpe roseis seu purpureis, superioribus sursum divergentibus, inferiore latiore porrecto seu paullo deflexo; floribus lateralibus grandibus; ovarii squamis 30–40 triangularibus et sepalis tubi late campanulati 20–30 inferioribus oblongis abrupte cuspidatis in axilla villosa aculeolos paucos flexuosos elongatos gerentibus; sepalis superioribus 10–15 oblongo-obovatis obtusis seu cuspidatis; petalis 15–18 late obovatis obtusis eroso-denticulatis; stigmatibus 10–13 elongatis erecto-patulis; bacca ovato-subglobosa magna purpurascente aculeolis elongatis numerosis deciduis armata; seminibus obovatis obliquis tuberculatis; hilo oblongo parvo; cotyledonibus subcurvatis. (Tab. XLVI—XLVII et tab. XLVIII, fig. 1.)

On high gravelly table-lands, and on the mountain-slopes about El Paso, extending east to the Pecos and west to the Gila, *Wright*, *Bigelow*, *Parry:* fl. June; fruit ripe in July and August.—A most remarkable plant, on account of the immense masses it forms, one plant often consisting of 100 or 200 heads in a regular hemispherical mass, which is covered and defended by the long, flexuous, straw-colored spines: those have suggested the specific name of the plant. Single heads 5–9 inches high and 2–3 inches in diameter, tapering towards the top, at base closely impacted together. Areolæ in vigorous plants ¾–1 inch apart, in older plants becoming more approximate. Radial spines ¾–1½ inch long, on the lower part of the plant shorter. Central spines 2–3 or even 3½ inches long, straight or variously twisted, and the younger ones red or brown. Flower 3 or 4 inches in length, and spreading as wide or

wider, appearing very full from the broad (8–12 lines) and numerous petals of a bright purple or deep pink color, inclining to crimson. Ovary with only few spines (2–4 lines long) on each pulvillus; the spines on the tube more numerous and about twice as long. These spines increase in number and length during the growth of the fruit, so that at maturity we find 8 or 10 in each fascicle, ½ to 1 inch in length. Fruit 1½–2 inches long, 1½ inch thick, readily shedding the spines, purple, of a delicious taste, intermediate between a strawberry and a gooseberry. The small seeds (0.5–0.7 line long) cannot be distinguished from those of the last species. The tubercles are large for the size of the seed and very distinct.

12. C. DUBIUS (sp. nov.): ovato-cylindricus, pallide viridis, cæspitosus; costis 7–9 obtusis tuberculatis; sinubus latis parum profundis; areolis orbiculatis remotis; aculeis albidis subpellucidis, radialibus 5–8 teretibus seu subangulatis, superioribus sæpe deficientibus, centralibus 1–4 bulbosis angulatis elongatis rectis seu incurvis; floribus lateralibus; ovarii pulvillis 20 in squamæ triangularis axilla parce villosa aculeolos paucos breves gerentibus; sepalis tubi inferioribus 16–20 ovato-lanceolatis cum aculeolis 1–3 longioribus; sepalis superioribus sub-10 oblongo-spathulatis obtusis; petalis sub-10 spathulatis obtusis pallide purpureis; stigmatibus 8–10; bacca subglobosa virescente-purpurea fasciculis aculeolorum 8–12 elongatorum deciduis armata; seminibus globoso-obovatis obliquis confluento-tuberculatis, hilo circulari. (Tab. L.)

Sandy bottoms of the Rio Grande, and from El Paso, *Wright*, *Bigelow*, to below Presidio, *Parry*, with *Algarobia*, *Fouquiera*, and *Larrea*; fl. June and July.—Stems 5–8 inches high, not so densely cæspitose as the last one, of a pale green color and soft flabby texture; ribs few, broad; grooves shallow; radial spines 6–12 or 15 lines long, lower ones longer than upper ones, or the upper spines very commonly entirely wanting, and replaced by the three upper central ones; central spines 1½–3 inches long, the lower one somewhat stouter and longer than the upper ones. Flower 2½ inches long, of the same diameter; petals fewer and narrower than in the last species, only 6 lines wide, paler, (rose-colored,) and mostly quite obtuse and almost entire. Ovary in this, as in the last species, remarkably small and undeveloped, while the flower is fully open; its spines few and short, growing afterwards in length and numbers more than is noticed in any other species. Ripe fruit 1–1½ inch long, with 20–24 pulvilli, on each of them 9–12 bristly spines, 4–9 lines long; fruit green or rarely purplish, insipid or pleasantly acid. Seed larger than in the two last species, 0.6–0.7 line long, subglobose-obovate, with a circular hilum; the tubercles not distinct as in the others, but confluent, and forming pits in the interstices.—These three species are very nearly allied, but are said to be easily distinguished in their wild state; the characters given above are said to be quite constant, and seem to establish them as good species.

13. C. ENGELMANNI, Parry in Sill. Journ. 1852: ovato-cylindricus, e basi parce ramosus; costis 11–13 interruptis; areolis orbiculatis subconfertis, junioribus villosis; aculeis radialibus 13 sub-angulatis albidis apice adustis rectis seu paullo curvatis, lateralibus 6 longioribus, inferioribus 3 vix brevioribus, superioribus sub-4 parvis; aculeis centralibus 4 angulatis gracilibus rectis multo longioribus, inferiore longiore albido porrecto seu deflexo, superioribus fulvis arrectis; floribus sub apice lateralibus; ovarii pulvillis sub 30 aculeolos rigidos 8–14 gerentibus; sepalis tubi inferioribus 15–20 ovato-lanceolatis ad axillam villosam aculeiferis; petalis purpureis; stigmatibus 12 erectis viridibus; bacca ovata; seminibus oblique obovatis tuberculato-foveolatis, hilo subbasilari oblongo. (Tab. LVII.)

Mountains about San Felipe, on the eastern declivity of the Californian Cordilleras, *Parry;* common in the Gila valley, especially near the Casa Blanca, above the Pimas village, *Schott*: fl. in June.—Loosely cæspitose, not more than 4 or 6 or at most 8 stems together; stems 5–10 or even 12 inches high, 2–3 inches in diameter; radial spines 3–6 lines long; central ones 1–2 inches long, upper one the shortest, lower one the longest. Flower rather low down on the plant, between 2 and 3 inches long; fruit at last naked, fleshy, 1½ inch long, an inch in diameter; seed 0.6–0.7 line long, similar to that of *C. Fendleri*, to tubercles running together, and forming irregular pits.

14. C. POLYACANTHUS, E. in Wisl. Rep.: ovato-cylindricus, plerumque ramosissimus, cæspitosus, glaucescens; costis 9–13 subcompressis obtusis interruptis; areolis suborbiculatis remotiusculis seu demum confertis; aculeis teretibus robustis rigidis rectis albidis seu e cinereo rubellis apice obscuris demum totis cinereis, exterioribus 8–12 parum bulbosis, lateralibus longioribus, centralibus 3–4 bulbosis paullo robustioribus æquilongis seu longioribus, junioribus sæpe corneo-fuscoque variegatis; floribus sub vertice lateralibus diu noctuque apertis; ovarii pulvillis 16–20 tomentosis aculeolos 6–15 variegatos gerentibus; sepalis tubi inferioribus 10–12 triangulari-lanceolatis aculeiferis, superioribus lineari-lanceolatis seu oblanceolatis spathulatisve mucronatis seu summis obtusis; petalis 18–22 spathulatis obtusis integris seu erosis chartaceis coccineis basi pallidioribus erecto-patulis; tubo intus basi nudo, staminibus brevibus; stylo exserto; stigmatibus sub-8 erectis; bacca subglobosa; seminibus majusculis irregulariter tuberculatis; hilo subbasilari parvo angusto; embryone parcissime albuminoso; cotyledonibus brevibus incurvis. (Tab. LIV–LV.)

A common plant at El Paso, *Wright*, *Bigelow*, *Parry*, *Thurber*, and as far south as the mountains west of Chihuahua, *Wislizenus*, on table-lands and mountains, and also on sand-ridges or stony hills: fl. March and April, fr. in June.—Heads 5–10 inches high, 2½–4 inches in diameter, pale green or glaucous; areolæ ½–1 inch apart; spines very variable; exterior ones not strictly radiating but spreading; upper ones about 6 lines; lateral and lower ones 9–12 lines long; central spines in young specimens single, in older and more perfect ones always 3–4; in some hardly longer than the radial ones, 9–12 lines long, but usually longer, and sometimes 2 or even 2½ inches long; lower central spine always longer than the others. Flowers 2–3 inches in length, spreading not quite so wide, remaining open day and night, often for 4 or 5 days, and profusely adorning the plant for 4 or 6 weeks in succession; petals rigid and somewhat concave, rounded, of a deep red or blood color; the base of the tube inside naked for 3 or 4 lines; stamens about 600; berry ¾–1¼ inch long, greenish-purple, of a pleasant gooseberry taste; seeds larger than in any other *Echinocereus* known to me, 0.8–0.9 line long, oblique; hilum small subbasilar; embryo with some albumen, (which is not common in this genus,) large, a little curved; cotyledons almost foliaceous, approaching the form observed in the cylindric *Cerei*.

15. C. PAUCISPINUS (sp. nov.): ovatus seu ovato-cylindricus, perviridis, simplex, seu parce ramosus, costis 5–7 interruptis; sulcis latis sursum acutis; areolis remotis; aculeis 3–6 seu rarius 7 robustis basi bulbosis rectis seu subrecurvis radiantibus, infimo pallidiore, cæteris rufis fuscisve, omnibus demum nigrescentibus, centrali nullo seu rarius singulo robusto subangulato atrofusco sursum verso seu porrecto; seminibus obovatis obliquis subconfluento-tuberculatis, hilo basilari elliptico. (Tab. LVI.)

From the San Pedro to the mouth of the Pecos, on rocks and gravelly limestone hills, *Wright*, *Bigelow*.—Stems 5–9 inches high, 2–4 inches in diameter, not cæspitose like the last species

to which it seems to be allied, but either simple or with few branches from near the base; ribs few, grooves wide and shallow; areolæ 8–10 lines apart; spines few and dark colored, 9–15 lines long, upper one often shorter, and central spine when present 15–20 lines long; flower and fruit unknown; the seed sent by Mr. Wright is similar to that of *C. polyacanthus*, 0.7–0.8 line long, oblique, with slightly confluent irregular tubercles, and a large and wide hilum.—This species on the Pecos seems to take the place of the more western *C. polyacanthus*, which farther east is represented by *C.Ræmeri*, and farther west by *C. phœniceus*; from all these it is distinguished by the few ribs and the few dark spines.

16. C. BERLANDIERI (sp. nov.): humilis, perviridis; caule subtereti articulato-ramosissimo; tuberculis conicis distinctis 5–6-fariis; areolis parvis orbiculatis; aculeis tenuibus subsetaceis, 6–8 brevibus radiantibus albidis, 1 centrali plerumque multo longiore fuscato; floribus lateralibus magnis purpureis; ovarii puvillis sub-20 breviter albo-tomentosis aculeolos capillaceos basi bulbosos 8–10 longiores albidos et 1–2 robustiores fuscos gerentibus; sepalis tubi exterioribus 8–10 aculeoliferis, superioribus 13–16 oblongo-linearibus acuminatis seu cuspidatis; petalis 14–18 late linearibus seu lineari-oblanceolatis elongatis fere loricatis mucronatis apice denticulatis patulis demum reflexis; stigmatibus 7–10 viridibus; bacca ovata viridi subsicca; seminibus parvis obovato-subglobosis tuberculatis, hilo circulari.—(Tab. LVIII.)

On the Nueces, *Berlandier*. Frequently in cultivation under the wrong names of *C. repens* or *C. Deppii*, doubtless introduced from southern Texas: fl. May and June.—A spreading and procumbent plant, with erect branches contracted at base, and thereby articulated, 1½–6 inches long, ¾–1 inch thick, either terete with distinct spirally disposed tubercles, or the tubercles arranged in 5 or 6 ribs. Areolæ 4–6 lines apart; radial spines bristle-like, weaker than those of the next species, 4–5 lines long, sometimes a stouter and darker one at the upper end of the areola; central spine yellowish-brown, shorter on the lower part of each branch, longer towards the top, from 5–6 to 10–13 lines in length. Flower 3–4 inches long, or when fully open spreading almost 4 inches and only 2 inches in height; bristles of the tube below 2–3 lines, upwards 4–6 lines long, the tomentum white and short; petals long and narrow, 3–4 or rarely 5 lines wide, bright rose-purple; filaments short, pale rose-colored; stigmata long and suberect; berry about 9 lines long, densely covered with the elongated mottled hair-like spines; seeds 0.5 line long, strongly and distinctly tuberculated, contracted at base. Nearly allied to *C. pentalophus*, DC., which, however, is an erect plant.—Named for *Dr. J. L. Berlandier*, who made known this as well as many other plants of the lower Rio Grande.

17. C. PROCUMBENS, E. in Pl. Lindh. 1850: humilis, perviridis; caule subtereti seu 4–5 angulato articulato-ramosissimo; tuberculis distinctis spiralibus seu 4–5 fariis; areolis parvis-orbiculatis; aculeis rigidis brevibus albidis apice fuscis, 4–6 radiantibus, centrali nullo seu singulo paullo longiore obscuriore; floribus sub apice ramorum lateralibus magnis; ovarii pulvillis sub 25 albido-villosis aculeolos rigidos 6–9 breves variegatos gerentibus; sepalis tubi exterioribus 12–15 aculeoliferis, superioribus sub-15 lineari-lanceolatis acuminatis; petalis 18–20 lineari-spathulatis acutis seu obtusis, integris seu plerumque eroso-dentatis patulis demum recurvis violaceis basi flavidis; stigmatibus 10–14 stamina flavicantia superantibus; bacca ovata viridi irregulariter dehiscente; seminibus parvulis lenticularibus basi hilo oblongo truncatis verruculosis. (Tab. LXIX, fig. 1-11.)

On the Rio Grande below Matamoras: fl. May and June.—Similar in habit to the last, but more slender; branches ½ to 3 or 4 inches in length, 6–8 lines in diameter; tubercles 4–5 lines

apart, in 4 rows when the branches appear acutely quadrangular, or in 5 rows when they are more terete. Radial spines 1–2 lines long, central one on lower part of joint wanting, or hardly longer than the radial ones, on the upper part 2–4 lines long. Flower about 3 inches long and of same width; petals often reflexed, 4–6 lines wide. Fruit 6 or 8 lines long; seed between 0.4 and 0.5 line long, much compressed, with a narrow hilum; its tubercles very much smaller than in the last species. Our plant bears a close resemblance to the last mentioned one, but may always easily be distinguished by the characters enumerated.

18. C. TUBEROSUS, Poselger: e radice tuberosa tenuissimus, teres, lignosus, sursum sensim incrassatus, cylindricus, demum articulatus parceque ramosus, debilis, erectus seu geniculatus et reclinatus; costis 8 vix prominulis; areolis parvis confertis, junioribus parce sordide tomentosis; aculeis 9–12 radiantibus parvulis subulatis albidis rectis adpressis, inferioribus paullo longioribus, centrali singulo e basi crassa subulato longiore toto seu versus apicem fusco sursum arrecto; floris subterminalis (?) tubo brevi; pulvillis squamatis albo-lanatis aculeolatis; sepalis superioribus 8 lineari-lanceolatis; petalis 16 oblanceolatis acuminato-aristatis roseis patentibus; filamentis brevibus; stylo elongato; stigmatibus 8 viridibus; bacca subsicca villosa setosaque floris rudimentisque coronata; seminibus minutis oblique obovatis compressis tuberculato-rugosis scrobiculatis. (Tab. LXIX, fig. 12.)

On the Texan side of the Rio Grande, between Reynosa and Camargo, *Dr. Poselger;* on the Chacon hills, 3 miles below Laredo, and also near Mier, on arid rocky ridges, always among shrubs, "which support its weak and otherwise almost decumbent stem," *A. Schott.*—Tuberous root globular, ¾–1½ inch in diameter; stem 1–2 feet high; lower part ligneous, scarcely as thick as a quill; upper younger part and branches 4–8 lines in diameter; young branches few, clavate; ribs very little prominent; areolæ 1–2 lines apart; radial spines a line long or less; central spine 2–3 lines long, in weak specimens whitish, in robust ones the upper half or the entire spine brown or black, rigidly erect and appressed, generally reaching to the second areola above. The flower, which I have not myself seen, is described by Dr. Poselger in a letter as being terminal, "so that the ovary is a complete continuation of the stem." I suppose that it rises from the upper, but certainly not the recent areolæ; and that it cannot be truly terminal, i. e., a continuation of the axis, which would be in opposition to the character of the whole family. Schott also figures the plant as bearing fruit at the end of the branches. Flower over 2 inches long and of the same diameter, opening for several days, but only in bright noonday sunshine; ovary and tube covered with very woolly pulvilli in the axils of reddish scales, with 6 or 8 long white or black bristles; petals rose-colored or purple, about an inch long. Fruit covered with long wool and black and white bristles, resembling very much that of *C. cæspitosus.* Seed smaller than that of any other *Cereus* examined by me, only 0.4 line in the largest diameter, rugose from confluent tubercles which leave large pits between them. Albumen none; embryo almost straight, with distinct transverse cotyledons. Flower, fruit, and seed identify this species with the *Echinocerei,* thus furnishing another instance, if such were still needed, of the importance of the organs of fructification in the study and arrangement of the *Cactaceæ,* and of the fallacy of expecting the external shape of these plants to furnish characters for generic or subgeneric division. Without the knowledge of the flower and fruit, *C. tuberosus* would no doubt have been classed with the *Cerei articulati,* while in reality it is the slenderest *Echinocereus,* connected with the ordinary ovate or globose forms through *C. Berlandieri* and *C. procumbens.*

Subgen. 2. Eucereus.*

19. C. Emoryi, E. in Sill. Journ.: caule cylindrico 2–3-pedali prostrato; ramis adscendentibus seu erectis; costis 15 tuberculatis; sinubus acute incisis; areolis confertis orbiculatis, junioribus fusco-tomentosis; aculeis rectis rigidis gracilibus aciculatis e virescenti flavis numerosissimis intertextis, exterioribus 40–50 tenuissimis stellatim porrectis, centrali singulo robustiore multo longiore; floribus subterminalibus flavis; tubo breviusculo aculeolato; bacca globosa aculeatissima; seminibus magnis obovatis acute carinatis basi acutis lucidis minutissime sub lente tuberculatis, hilo ventrali angusto; cotyledonibus foliaceis hamatis incumbentibus. (Tab. LX, fig. 1–4.)

On dry hills and mountains, near the coast of California, about San Diego, growing in thick masses, and covering patches of 10 or 20 feet square, *Dr. Parry;* not north of the boundary line, *Dr. Le Conte.*—Prostrate stems 2–3 feet long; branches 6–9 inches high, 1½ inch in diameter; flowers abundant near the top of the branches, rather short, yellow, 2 or 2½ inches wide. Fruit 1½ inch in diameter, densely covered with numerous pulvilli, each bearing 20 or 25 stiff yellow spines, from 2 to 6 lines in length, 3 of them stouter and longer than the rest, often about an inch in length; some indistinct remains of the dead flower are hidden among the spines. Seed 1.2–1.4 line long, with a very prominent keel and linear hilum. The short aculeolate flower, persistent on the spinose fruit flower, would seem to refer our plant to *Echinocereus*, but the seed and embryo permit no doubt about its position. I have seen specimens of a fruit of a columnar *Cereus* from the Pacific coast near Mazatlan, sent by the late Dr. J. Gregg, which is a gigantic representative of our California fruit, and suggests the idea that on the western coast of our continent several species exist of a still unknown section of *Cereus*.—This plant, peculiar to the western termination of our boundary line, fitly bears the name of the energetic and distinguished commissioner under whose auspices the greater part of the interesting plants here described have been collected.

20. C. variabilis, Pfeiff., a tall species, 3–10 feet high, is common to the east as well as west coast of tropical America, extending northward to the mouth of the Rio Grande, and up that stream towards Matamoras. Full-grown stems 3–4 angled, with few and stout spines; but young shoots with 8 ribs and numerous slender spines; flowers white, nocturnal; fruit oval, about 3 inches long, spinose, crimson externally and internally; seeds obliquely obovate, compressed, smooth, and shining, 1.5–1.7 line long; hilum subventral, narrowly oblong, linear, albumen almost none; embryo much curved; cotyledons large, foliaceous, incumbent. (Tab. LX, fig. 5–6.)

21. C. Greggii, E. in Wisl. Rep.: e radice crassa napiformi erectus, gracilis, 2–3-pedalis; ramis paucis erectis 3–6-angulatis atro-virentibus sæpe rufescentibus; costis acutis; sulcis latis planiusculis; areolis oblongo-linearibus confertis seu subconfertis, junioribus lana e cinereo

* This section is proposed here only as a receptacle for our few *Cerei* not included in the other subgenera. It is not impossible that the greater part of the species of this genus will have to be referred here, but it is more probable that a careful examination of the flower and fruit of the numerous southern *Cerei* will necessitate the formation of several other subgenera. Not being familiar with the great majority of the species, I refrain from characterizing *Eucereus*. I will only state that the few species referred here have an elongated stem; spines on the flower-bearing and sterile part of the plant not different; tube of the flower elongated and beset with hairy or spiny pulvilli; stigmata whitish; berries usually with deciduous (or persistent?) spines; dry remains of the flower usually at length deciduous; seeds mostly smooth and shining, and the embryo hooked, with curved foliaceous cotyledons.

nigricante demum decidua vestitis; aculeis e basi bulbosa crassa abrupte subulatis acutissimis brevissimis nigricantibus, vetustis cinereis, radialibus 6–9 subrecurvis, infimis 3 tenuioribus longioribus, centralibus binis superimpositis brevibus, rarius singulo; floribus lateralibus albidis seu ochroleucis (nocturnis?); ovarii ovati pulvillis orbiculatis obscuro-villosis vix aculeolatis; tubi elongati sepalis 40–60 squamiformibus linæri-lanceolatis acuminatis, inferioribus aculeolos paucos breves, superioribus plures capillares gerentibus; sepalis interioribus 15–20 et petalis totidem lanceolatis acuminatis; stylo stamina æquante; stigmatibus sub-10 erecto-patulis albidis; bacca ovata basi contracta apice rostrata floris rudimentis siccis recurvis demum decidua coronata pulvillis aculeoligeris mox nudatis munita coccinea pulposa; seminibus magnis oblique obovatis rugosis tenuissime tuberculatis; hilo subbasilari circulari; albumine parcissimo; embryone cotyledonibus foliaceis incumbentibus hamato.

Var. *α.* CISMONTANUS: areolis elongatis; floris tubo minus gracili aculeolis brevioribus munito; petalis latioribus. (Tab. LXIII, LXIV.)

Var. *β.* TRANSMONTANUS: areolis ovato-orbiculatis; floris tubo graciliori aculeolis longioribus tenuiter capillaceis flexuosis munito; petalis lineari-lanceolatis longe acuminatis. (Tab. LXV.)

From the San Pedro in western Texas, *Parry, Wright, Bigelow;* to the Gila, *Emory;* and Sonora, *Thurber, Schott;* and from the Rio Grande, south to Chihuahua, *Gregg, Wislizenus,* in gravelly or hard clayey soil, nowhere a common plant: fl. May and June.—Root a large fleshy, dirty-yellowish tuber, often 4–6 inches in diameter and 6–10 inches long, generally producing but one stem 2–3 feet high, with erect branches; stem thin at base, rather terete and ligneous, upwards 9–12 lines in diameter, usually 4–5, angled. The acute ribs at first sight seem crenulated, the pulvinate areolæ being separated by a slight depression, and the spines being scarcely visible without a close examination. Areolæ 1–1½ line long, in younger shoots 5–6 within one inch of the rib, in older plants about 3 areolæ in the same space. Spines remarkably short and sharp from a disproportionately thick base, only ½–1 line long; the 3 lowest spines are the longest, and run into a fine bristle-like point, often somewhat curved and not rarely crossing each other; above them 2 or usually 3 pairs of lateral spines, points of the lower ones diverging downward, and of the upper ones rather upward; central spines mostly 2, very short and thick, the lower one turned downward, the upper one upward. The spines seem to grow in size for several years, as on the older part of the stem they are twice as thick, though not any longer than the younger ones; they also become irregular, some of the smaller apparently dropping out, while the larger ones crowd into the vacant space, (see figure.) The flowers have been seen by only *Dr. Gregg* and *Mr. Thurber;* they seem to be nocturnal, as the latter gentleman collected them in the early morning hours, commencing to fade. Ovary 9–12 lines long, whole flower 6–8 inches long, about 2½ inches in diameter; bristles at base of tube 1–2 lines, or upwards 4–6 lines, and in var. *β.* 6–10 lines long; style not reaching above the large anthers; stigmata about 10, suberect. Berry ovate, 1½–1¾ inch long, an inch in diameter, slightly contracted at base, but not stiped nor even clavate, as I formerly was induced to believe, somewhat rostrate at the upper end, bright scarlet, fleshy, and edible. Seeds 1.2–1.5 line long, 1 line thick, with a large hilum; the warts of the testa are flat and very minute, but the large wrinkles are very distinct to the naked eye. The young seedling has quite short cotyledons, which finally form a thickened ring around the base of the young stem; this stem is always triangular, of a reddish-brown color, the edges showing an almost continuous line of the characteristic small and sharp spines; the root very soon swells, as our figure

shows, and assumes the shape of a small carrot, almost as large as the stem itself; in old specimens the root is very much larger than the whole stem and branches together.

Subgen. 3. Lepidocereus.*

22. C. gigantеus, E. in Emory's Rep. 1848: erectus, elatus, cylindricus, versus basin apicemque sensim attenuatus, simplex seu parce ramosus, candelabriformis; ramis paucis erectis caule brevioribus; vertice applanato tomentoso; costis infra sub-13 sursum 18–21 rectis, vetustis (versus caulis basin) obtusis obtusissimisque, sursum e basi lata acutatis acie obtusatis subrepandis; sinubus ad basin caulis latissimis versus apicem profundis acutis angustioribus angustissimisque; areolis prominentibus ovato-orbiculatis, junioribus albido-tomentosis; aculeis rectis basi valde bulbosis tenuiter sulcatis et subangulatis albidis seu stramineis demum cinereis; radialibus 12–16, imo summisque brevioribus, lateralibus (præcipue inferioribus) longioribus robustioribus, subinde aculeis adventitiis paucis setaceis summo areolæ margini adjectis; aculeis centralibus 6 robustis albidis basi nigris apice rubellis demum totis cinereis, 4 inferioribus cruciatis quorum infimus longissimus validissimus deflexus, 2 superioribus brevioribus lateralibus sursum divergentibus; floribus versus apicem caulis ramorumque aggregatis; ovarii ovati sepalis 30–40 squamiformibus triangulatis acutis ad axillam albido, seu fulvo-villosam aculeolum unum alterumve nigricantem deciduum gerentibus; sepalis tubi ampliati brevisculi 30–40 orbiculato-subdeltoideis mucronatis, inferioribus in axilla lanigeris, superioribus nudis; sepalis intimis 10–15 spathulatis obtusis carnosis (pallide viridibus albescentibus); petalis sub-25 obovato-spathulatis obtusis integris crispatis coriaceo-carnosis crassis (ochroleucis seu albidis); staminibus numerosissimis superiori tubi parti adnatis, inferiore nudo; stylo stamina paullo superante; stigmatibus 14–18 filiformibus fasciculatis; bacca obovata seu sæpe pyriformi squamis triangulatis carnosis parvis ad axillam lanatis munita, floris rudimentis decidnis; pericarpio duriusculo coriaceo demum valvis 3–4 irregularibus patulis reflexisve dehiscente; seminibus numerosissimis in pulpa saccharina coccinea nidulantibus oblique obovatis lævibus lucidis exalbuminosis; hilo oblongo basilari; cotyledonibus foliaceis incumbentibus hamatis. (Tab. LXI, LXII, et tab. front.)

In rocky valleys and on mountain sides, often in mere crevices of rocks, from the valley of Williams' river, lat. 35°, *Bigelow*, to Sonora, lat. 30°, *Thurber*, *Schott*; and from the middle Gila, *Emory*, down to near its mouth, *Parry*. I cannot find that it has been collected west of the Colorado, though it is probably also an inhabitant of the Californian peninsula: fl. May to July; fruit ripe in July and August. The *Suwarrow* or *Saguaro* of the natives.—Young plants, as *Dr. Bigelow* observed, are almost always found under the protecting shade of some shrub, especially of Frémont's "green-barked Acacia" (*Cercidium Floridanum*) so characteristic of the barren wilderness; and not rarely the dead stems of this plant are found near the older *Cerei*. Young plants retain their globose shape for several years; a specimen in my possession, 5 or 6 inches high, is supposed to be between 8 and 10 years old. It flowers at the height of 10 or 12 feet, but grows up to 4 or 5 times that height; stems have been measured 46 feet high, and higher ones are stated to occur, so that the first statement of *Col. Emory* is not at all improbable, viz: that this plant sometimes has been found 50–60 feet high. The stem is thickest in or a little above the

* This subgenus is proposed for the two tall western species with uniform spines, short flowers, ovary and tube with numerous scale-like imbricated sepals, fleshy petals, pale stigmata, smooth seeds, and hooked embryo. Probably *C. Chilensis*, and perhaps other species from the Pacific slope of the continent, will find their place here. A drawing of *C. Chilensis*, among the papers of the United States Exploring Expedition, represents a flower almost identical with that of *C. Thurberi*.

middle, and tapers upwards and downwards; one was found by *Dr. Bigelow* to be at one foot above the ground 13 inches, and 10 feet higher more than 23 inches, in diameter. The fleshy part of the plant is, as he notes, bitter, and not acidulous, as in most species of Cacti. The ligneous skeleton consists of thick (1–2 inches thick) and somewhat terete perpendicular bundles of fibres, corresponding in number and position to the grooves of the stem; in younger plants and on the upper part of the older ones these sticks are distinct, and sway in the wind like so many reeds, but at the lower part of the older stems they are reticulately connected with one another by ligneous tissue, the open meshes corresponding (just as in the cylindric *Opuntiæ*) with the bunches of spines or tubercles; in the oldest stems the inner cavity becomes nearly filled by the same tissue. Stems mostly simple; older ones often with a few erect branches; they are rarely much branched, but specimens have been observed where 5–9 branches sprang from the same part of the main stem; the primary branches very rarely produce secondary ones. The branches usually drop off from the skeleton of the dead stems; but in very old specimens they remain, and present a view like the one in our landscape plate opposite the title-page, which is taken from an accurate sketch made on the spot by *Mr. Mœllhausen*.—Ribs at the base of the stem few (12–15), broad, obtuse, often almost obliterated, and generally without spines; higher up the number of ribs increases to about 18–21; they are triangular with an obtusish edge, separated by deep triangular acute grooves; towards the top of the plant the young ribs are narrowly compressed, with obtusish edges and narrow grooves between them. The somewhat pulvinate areolæ are 7 lines long, nearly 6 lines in diameter, about an inch distant from one another, sometimes more closely approximate; at first they are covered with a thick yellowish or tawny tomentum. Lower and upper radial spines 6–12 lines long, sometimes a few additional shorter flexuous setaceous spines are placed above; lateral ones 12–18 lines long, the lower ones longest; the 4 lower central spines straight, or very slightly curved downwards 20–30 lines, the 2 upper central spines 15–18 lines long, diverging upwards. The stoutest spines are one line in diameter, their bulbous base fully twice as thick. In old age, and towards the base of the stem the 6 central spines fall off first, leaving the radiating ones appressed to the stem; finally these also come off, together with the whole areola. The flowers are produced in abundance near the summit of the stems and branches; the fruit is usually found 6–12 inches from the centre of the top. Specimens of flowers have been sent by *Mr. Thurber* and by *Mr. Schott;* those of the former are not over 3 inches long; the others have a longer tube, and are between 4 and 5 inches in length and 3–4 inches in diameter; the flowers are probably open day and night. Ovary 1–1½ inch long; lower scales of the tube triangular; upper sepals fleshy, greenish-white, ¾–1 inch long, lower ones 2, upper ones 3–4 lines wide; petals of a light cream color, 1–1½ inch long, 6–8 lines wide above, very thick and fleshy, and very much curled. Filaments light yellow, adnate to the upper half of the tube, its lower part for the length of 1 or 1½ inch naked. Stigmata over half an inch long, slender, suberect, of a greenish-yellow color. Fruit 2½–3 inches long, 1½–2 inches in diameter, oval or obovate, or often narrowed at base and almost pear-shaped, (perhaps where many are crowded together;) the remains of the flower falling off leave a broad convex scar; the color of the fruit is green, and towards the upper end reddish. The pericarp has the hardness of a green cucumber, somewhat softer towards the apex, and is about 2 lines thick; it bursts open on the plant with 3 or usually 4 valves, which are red on the inside, and when spreading horizontally, or somewhat recurved, look like a red flower. The crimson-colored sweet but rather insipid pulp has the consistency of a fresh fig; it completely separates from

the rind, and, drying up from the heat of the sun, falls to the ground. The innumerable black seeds are 0.7–0.9 line long. Those brought by *Mr. Thurber*, and largely distributed in this country and in Europe, have well germinated; the cotyledons are short and acute; the seedling plant is globose, grows very slowly, and is rather delicate.

23. C. Thurberi, E. in Sillim. Journ.: caulibus erectis seu adscentibus elatioribus fasciculatis articulatis 13–14-costatis; sinubus planiusculis; areolis subremotis pulvinatis griseo- seu fulvo-tomentosis; aculeis 7–15 gracilibus rectis flexuosisve fusco-atris demum cinereis valde inæqualibus irregulariter fasciculatis; floribus infra caulis apicem lateralibus aggregatis; ovarii squamis sepaloideis 80–100 pluribusve triangularibus imbricatis axilla lanam copiosam albidam sæpe fulvam sæpeque aculeolos paucos nigricantes gerentibus; sepalis tubi sub-50 olivaceis, inferioribus acutiusculis, superioribus obovato-spathulatis obtusis; petalis obtusis carnosis albidis; bacca magna globosa aculeolata demum nuda olivacea intus coccinea; seminibus numerosissimis oblique obvatis dorso carinatis læviusculis (sub lente minutissime tuberculatis) lucidis exalbuminosis; hilo oblongo subbasilari, embryone cotyledonibus foliaceis curvatis incumbentibus breviter hamato. (Tab. LXXIV, fig. 15.)

In a rocky cañon near the mountain pass of Bacuachi, Sonora, *Thurber;* on all the sierras of Sonora westward of the Sierra Madre, and more common southward, *Schott;* called there *Pitahaya:* fl. June and July; fruit in July and August.—Stems 5–15 from one root, fasciculated, erect or ascending, "curved *inward*," 10–15 feet high, articulated, lower joints 2–3, upper ones 5–6 feet long, 4–6 inches in diameter; ribs 13–14, very slightly prominent. The skeleton of this species, according to *Mr. Schott's* observations, consists of flattened bundles of wood, very loosely connected by transverse fibres, so as to form a kind of hollow tube. Areolæ pulvinate covered with brownish or ashy wool, only about three lines in diameter, 12–15 lines apart. Spines irregularly fasciculated, 7–10, according to *Mr. Schott's* notes; but 15 in the flower-bearing bunches before me. (Might not the flower-bearing spines be more numerous and perhaps more slender than the others, indicating a transition to *Pilocereus*?) Spines slender, flexible, almost setaceous, very unequal in length, 5–18 lines long in the same bunch, partly deciduous. Flowers usually 6–12 inches below the top of the plant, about 3 inches in length; ovary very densely imbricate with sepaloid scales, which bear dirty wool and often short bristly spines in their axils; in some specimens they are wanting, in others they also invest the fruit, but are easily brushed off at maturity. Fruit 3 inches in diameter, like a large orange, of delicious taste, the crimson pulp dotted with numerous black seeds. These are 0.9–1.0 line long only, a little larger than those of the last species, which they very much resemble, and very minutely tuberculated. The seeds germinate like those of *C. giganteus*, with very short acute cotyledons, and grow up with a globose head like the *Echinocerei* while all the *Eucerei* which I have seen germinating at once grow up in a cylindric or prismatic column.

Subgen. 4. Pilocereus.*

24. C. Schottii, (sp. nov.): caulibus suberectis elatioribus fasciculatis articulatis 4–7-(plerumque 5-) costatis flavo-viridibus; areolis in caulibus sterilibus remotis aculeos radiales

* *Cereus Schottii*, described in the text (evidently a *Pilocereus*, as that genus has been established by Lemaire) leaves no doubt in my mind about the propriety and necessity of a reunion of the "*Old man Cactus*" and its allies with *Cereus*. As a subgenus, *Pilocereus* would be characterized by the difference of the sterile and the flower-bearing parts of the plant, (the latter having more numerous, longer, and thinner, often hair-like spines,) and by the smaller flowers with all the parts reduced in number. The other characters ascribed to *Pilocereus* (filaments from the whole surface of the tube, and even from the top of the ovary, and especially the short and globose cotyledons,) are not found in our species.

4–6 robustos breves cinereos obscuros singulumque centralem breviorem obscuriorem gerentibus, in caule superiore florifero confertis lanam cinerascentem aculeosque 15–25 setiformes elongatos flexuosos angulosos rubello cinereos declinatos et quasi pendulos ferentibus; floribus in aculeorum barba pene occultis carneis; tubo gracili supra ovarium globosum 10-squamatum constricto decurvo intus basi nudo sepalis 10–12 lanceolatis instructo; petalis 10–12 oblongis obtusiusculis; stigmatibus 5–6 fasciculatis; bacca parva globosa squamosa pulposa coccinea floris rudimentis coronata; seminibus oblique obovatis carinatis lævissimis lucidis, hilo angusto subventrali; albumine parcissimo; embryone hamato cotyledonibus curvatis foliaceis incumbentibus seu subinde obliquis. (Tab. LXXIV, fig. 16.)

Sierra di Sonoyita, and southeast towards Santa Magdalena, Sonora, where it is named *Zisa*, or *Sina*, or *Sinita* by the inhabitants, *Schott*: in August with flower and ripe fruit. —Stems 8–10 or more from the same base; 8–10 feet high, ascending at base, and, when full grown, always curved outward at the top, the reverse of *C. Thurberi*; often many plants together, forming thickets, and covering a large space of ground; not rarely associated with the just-mentioned species. Stems of 2–4 articulations of 4 or 5 inches diameter; lower part entirely denudated of the quite deciduous spines. Spines of the sterile joints, or young plants, 5–7, not over 3 or 4 lines long; areolæ of the flowering joints 3 lines in diameter, covered with a dirty whitish tomentum, 2–3 lines apart; spines irregularly fasciculated, 10–25 in number, and from 1 to 4 inches long, flexuous and pendulous. Flower somewhat hidden in this reddish-grey beard, and its tube evidently bent downward by it; length of flower 1¼–1½ inch; sepals without any wool in the axils, olivaceous; lower ones triangular, acute; upper ones lanceolate; petals dirty flesh-color; stamina comparatively few, leaving the top of the ovary and the lower part of the tube naked; stigmata 5–6, filiform, broom-shaped, exactly like those of *C. giganteus* or *C. Thurberi*. Berry scarlet, 3 or 4 lines in diameter; seeds very similar to those of *C. giganteus*, but larger, 1.0–1.2 line long; germination very much like that of the last two species; cotyledons of seedling plant acute, short, spreading; head globose, but soon somewhat elongated, while both others remain globose for a long time. *C. Schottii* is closely allied to *Pilocereus scoparius*, Poselg. from Vera Cruz. This, however, is a larger plant, 20–25 feet high, 1 foot in diameter, with 12–15 ribs on the sterile, and 20–25 on the flowering part. I have named this interesting species, the only *Pilocereus* of our Flora, after its zealous discoverer, whom I have often had occasion to mention in these pages, and who, with all his other arduous duties in the field, still found leisure and inclination to study the Botany of the boundary from the Pacific to the Gulf of Mexico.

IV. OPUNTIA, Tourn., Mill.*

Subgen. 1. Stenopuntia.

Articuli complanati. Aculei non vaginati.
Flores parvi. Petala parva, subulata, erectiuscula (aurantiaca).
Stigmata pauca (1–3), acuta.
Bacca? et Semina?

* Besides its strictly differential characters (viz: the rotate corolla and the flat bony seeds with large foliaceous cotyledons) this genus is distinguished from the other Cactaceæ by its subterete, subulate and deciduous leaves, and by its barbed spines, which I do not find in any other plant of this family. These spines render *Opuntia* so much more disagreeable and even dangerous than other *Cacti*; in several species (*O. fragilis*, *O. Bigelovii*, *O. frutescens* and others) the joints easily separate from the stem and adhere by their barbed spines to the skin or clothes of the passer-by, the most annoying burs. Besides these spines, which are

The habit of the two species, the only ones yet known, is entirely that of the next subgenus; but the small flower (less than 1 inch in diameter) has numerous very small and narrow petals, and few and acute stigmata. *O. grandis*, the only other species known, has 2 or 3 stigmata, and *O. stenopetala* only one stigma. I must remark here, that all the ovaria I have opened contained no ovules and not even a cavity. May not the acute single style (an unique and anomalous case in this family) be in some connexion with this sterility, and may these flowers not be abortive or staminate forms?

1. O. STENOPETALA (sp. nov.): prostrata; articulis magnis crassis; pulvillis ad marginem confertissimis fusco-setulosis; aculeis sub-3 compressis ancipitibus curvato-deflexis seu patulis, adjectis sæpe 1–3 minoribus, omnibus atrofuscis; floribus ex areolis fulvo-villosis; ovari obconici tuberculati pulvillis 30–40 confertis albido-tomentosis setosis; sepalis tubi petalisque sub-25 lineari-subulatis acuminatis aristatis aurantiacis erecto-patulis; imo tubo nudo; stylo medio globoso-ventricoso apice indiviso acuto staminibus sub-breviore. (Tab. LXVI.)

Common on the battle-field of Buena Vista, south of Saltillo, Mexico, *Dr. J. Gregg*, 1848: fl. July.—The specimens before me consist of dried segments of joints, bearing flowers; joints apparently large, perhaps 7 or 8 inches in diameter, pulvilli about 1¼ or 1½ inch apart on the surface, but much crowded towards the edges, with much dirty-white wool, short dark brown bristles, and very dark, almost black, spines, lighter at the tip. The stouter spines 1½–2 inches long, flat on the upper, rounded on the lower surface, often much curved. Floriferous pulvilli very woolly; ovary about 9 lines long, leaves (or sepals) on the tubercles deciduous, very slender, 2–2½ lines long; sepals and petals 4–6 lines long, not more than one line broad at base, very slenderly acuminate, fleshy; sepals greenish-red; petals orange. Stamens numerous, half as long as the petals; style very much inflated in the middle, and to all appearances (I have carefully examined about six flowers) with a single pointed stigma. No fruit or seed was obtained, nor is it probable that these flowers would have ripened fruit, as no ovula could be found. Cannot this curious plant be obtained living? It is interesting to find in the Mexican *O. grandis*, mentioned above, (which has long been cultivated in European gardens, but has only lately, for the first time, flowered in Prince Salm's collection,) a very similar species, confirming this subgenus; this is an erect plant, with smaller joints, two white spines on the pulvilli, and 2 or 3 acute stigmata.

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usually, although not in every species, present, bristles are almost invariably found on each pulvillus, usually small, (less than 1 or 2 lines long, sometimes longer) and very numerous, mixed with soft wool. These bristles are extremely sharp and barbed backward, like the spines, and are loosely attached at their insertion; consequently, when touched, they come off from the plant and adhere most annoyingly to the skin or clothing. Both the *areola aculeifera* and the *areola florifera* are united in this genus into one circular or oblong *pulvillus* in the axil of the deciduous leaf. The spines occupy the lower, and the bristles the upper part of this *pulvillus;* between the bristles, and surrounded by them, and always above the spines, the young shoots or flowers originate. These bristles correspond with the bristles and wool in the axils of some *Eumamillaria*, and with the tomentum of the floriferous areola in *Coryphantha* and *Echinocactus*, but are quite distinct, morphologically, from the spines themselves. In *Eumamillaria* the aculeiferous and floriferous areolæ are entirely separate; in *Coryphantha* they are united by a long groove; in *Echinocactus* by a short one, or are quite contiguous, although always distinct; in *Cereus* we do not observe a persistent floriferous areola; the flower, as well as the young bud, bursts the epidermis above and close to the spiniferous areola, where a kind of floriferous areola is formed and continues till soon after the fall of the fruit, when it gradually disappears. In all these plants, the floriferous areola occurs only on the fully developed part of the plant, capable of bearing flowers. But in *Opuntia* the pulvillus (which in its lower part is the spiniferous, and in its upper part the floriferous areola combined, is the same in all stages of development; only it is smaller on the lower part of each joint, and bears fewer or often no spines, and rarely if any flowers or new shoots; while the uppermost *pulvilli* have the longest and most numerous spines and bear the flowers as well as the young branches. The *pulvilli* of *Opuntia* continue to grow year after year, and the bristles become longer and more numerous, and in many species the spines themselves grow stouter; sometimes new spines are developed between the bristles, indicating a low degree of continued vegetative activity on the rudimentary axis represented by the floriferous areola.

Subgen. 2. PLATOPUNTIA.

Articuli complanati, lanceolati, elliptici, obovati seu suborbiculati. Aculei nunquam vaginati.

Flores majores seu magni. Petala latiora, obovata seu orbiculata, flava seu rarius miniata, rarissime purpurascentia.

Stigmata plura (5–10) obtusa.

Bacca floris rudimentis dejectis late umbilicata, pulposa seu succosa, et inermis, rarius sicca et aculeata.

Semina margine latiore seu angustiore cincta.

Embryo plus quam circularis circa albumen parcum spiraliter convolutus. Cotyledones semper contrariæ, incumbentes.

This is the well-known form of *Opuntiæ*, with compressed and more or less elliptic joints, decumbent or erect, with fibrous or sometimes tuberous roots, mostly with spines only on the upper, or in one section (*Xerocarpeæ*) on all the pulvilli, rarely (principally the *Pubescentes*) spineless. Flowers commonly 2–3 inches and sometimes even 4 or 5 inches, in diameter; stigmata, as far as my observation goes, always from 5 to 8, or at most 10, in number, whitish, yellowish, or green, patulous or mostly erect. Fruits often edible, so that some species are cultivated for their fruits, and have been introduced into the warmer parts of the other continents; in the section *Xerocarpeæ* the fruits are spiny and dry. Seeds among the largest in the whole genus, or even in the whole family, in some species over 3 lines in diameter.

2. O. STRIGIL (sp. nov.): suberecta; articulis ovatis obovatis seu orbiculatis obtusis seu subinde subacutis tenuibus; pulvillis confertis, junioribus albido-villosis mox setis difformibus stramineis stipatis, omnibus aculeiferis; aculeis rufis fuscisque versus apicem flavidis, 5–8 radiantibus deflexis, versus margines articuli cum 1–2 robustioribus longioribus erectis patulis seu deflexis; bacca parva subglobosa late umbilicata areolis 25–30 minutis stipata rubra; seminibus parvis crassis obtuse marginatis. (Tab. LXVII.)

Western Texas, west of the Pecos, in crevices of flat limestone rocks, *Wright*, *Bigelow*.—About 2 feet high, pale green; joints covered with numerous pulvilli, each with a bunch of bright red-brown spines, paler at the tip, which give this plant a very showy appearance. Joints 4–5 inches long, 3½–4 inches wide; pulvilli 4–6 lines apart, prominent; their whitish wool soon disappears, leaving them covered with fine pale-yellow bristles, a dozen of which are longer than the rest, radiating upwards and laterally, and by joining the lower radiating spines forming with them a complete circle. Spines on most areolæ 5–8, on the lower ones (as usual) fewer, shorter and paler, on the upper and marginal ones more perfect; exterior radiating spines 3–4 lines, lower ones 5–8 lines long; the 1 or 2 stouter somewhat compressed spines on the upper areolæ are nearly an inch long, deep-brown below, light red-brown in the middle, gradually fading into yellow at the point. Flower unknown. Fruit 6–7 lines long, about 6 lines thick, with a broad and flat umbilicus; areolæ small, with grey wool and a few bristles. Seed 1½ line in diameter, rather irregular, very thick in proportion.—It would be desirable to obtain living specimens of this showy species, which could be easily done by travellers on the now well-frequented road between San Antonio and El Paso.

3. O. ENGELMANNI, Salm: erecta, grandis; caule demum lignoso tereti cortice cinereo rimoso obducto; articulis orbiculato-obovatis seu obovatis magnis pallide viridibus; pulvillis

remotis griseo-tomentosis; setis flavis rigidis valde inæqualibus sparsis; aculeis paucis (in areolis superioribus plerumque 2–3) validis compressis seu angulatis rectis seu subinde curvatis deflexis seu varie divergentibus stramineis corneisve basi rufis, cum adventitiis inferioribus 1–2 gracilioribus pallidioribus sæpe deficientibus; floribus flavis intus rubellis; ovario obvato-subgloboso seu rarius elongato subclavato sepalis e basi lata subulatis et pulvillis 20–25 griseo-sue fulvo-tomentosis parce setosis instructo; sepalis tubi sub-13, exterioribus ovato-lanceolatis acuminatis, interioribus orbiculato-obovatis cuspidatis; petalis 8–10 obovatis subspathulatis obtusis mucronatis; stylo crasso parum tumido; stigmatibus 8–10 erectis; bacca globoso-obovata seu rarius pyriformi late umbilicata; seminibus minoribus sub-irregularibus plerumque anguste marginatis. (Tab. LXXV, fig. 1–4.)

From the Canadian river, *Bigelow*, to New Braunfels, in Texas, *Lindheimer*, and to the mouth of the Rio Grande; westward to the Pecos and Presido, *Bigelow*, El Paso, *Wright*, and perhaps to the Pacific, *Parry*, south to Chihuahua, *Wislizenus*: fl. May and June.—A stout, coarse-looking plant, 4–6 feet high; lower part of old stems woody with loosely reticulated ligneous fibres, and with grey bark often covered with lichens, about 6 inches in diameter. Joints, in the larger specimens, one foot long, 9 inches in diameter; leaves subulate, 3–4 lines long, patulous; pulvilli 1¼–1½ inch apart, 3–4 lines in diameter; bristles coarse, sparse and very unequal; longer ones on the upper edge of the pulvillus sometimes 4–6 lines long; spines 1–1½ inch long, lower smaller ones 6–9 lines long. Flower 2½–3 inches in diameter, characterized by the usually quite short ovary, and the comparatively narrow and not emarginate petals; ovary commonly 1–1½ inch long, almost globose; in some instances, however, I have seen it clavate and nearly 2 inches long, (perhaps then sterile and inclined to become proliferous.) Fruit subglobose, somewhat contracted at base, nearly 2 inches long; umbilicus about an inch in diameter, flat or a little depressed; fruit dirty purplish, usually with a bright purplish pulp, of an insipid or even nauseous taste. Seeds usually less than 2 lines, in most specimens only 1.5–1.7 line in diameter, of a regular (from Matamoras) or commonly more irregular twisted shape, with an obtuse or acutish, rather narrow margin. Young plants, raised from seed, are characterized by the fascicles of very long (¾–1 inch) fine woolly hairs on the pulvilli, which appear in the second season, and remain for several years. Among the numerous varieties of this species, the var. *cyclodes*, from the Upper Pecos, has been described in Capt. Whipple's Pacific Railroad Report; another one was collected, by Mr. Wright, on the Limpia, with 1–6 stout, curved spines on the upper pulvilli, and none at all on the lower ones.

Dr. Bigelow distinguishes from this species another plant, which he has frequently observed near Presidio del Norte and Eagle Pass. From his notes, and from the meagre material on hand, I venture to describe it, without asserting its specific difference from the last species.

O. DULCIS (sp. nov.): adscendens, patula; articulis obovatis; pulvillis remotis; setis fulvis difformibus, exterioribus confertis tenuioribus brevioribus subæqualibus, interioribus uniseriatis robustioribus multo longioribus; aculeis 2–3 angulatis sæpius tortis pallidis deflexis, sæpe cum 1–3 gracilioribus; bacca ovata late umbilicata pallida; seminibus minoribus regularibus anguste marginatis. (Tab. LXXV, fig. 5–7.)

A sub-erect, spreading bush, lower and with smaller joints than the last species, and always with a very sweet and pleasant-tasted fruit. Plant about 2 feet high; joints ¼ foot long; spines 1–1½ inch in length, almost white; a semicircle of short spines or long bristles distinctly separates the spiniferous from the bristly part of the pulvillus; the bristles themselves are much

more numerous, finer, and more crowded than in *O. Engelmanni;* this arrangement of the bristles I find again only in *O. chlorotica*, Eng. & Big., from the Western Colorado The spines resemble *O. tortispina*, Eng. & Big., the flower and fruit *O. Engelmanni*, and the seed seems different from all these. Fruit 1½–1¾ inch long, one inch in diameter; umbilicus ¾ inch wide, shallow. Seeds 1.5–2.0 lines in diameter.

O. OCCIDENTALIS, E. & B. in P. R. R., found by *Dr. Bigelow*, "in immense patches, 40 miles east of Los Angeles," California, was also observed by *Mr. Schott* in the high valleys of San Pascual and Santa Isabel, northeast of San Diego, "covering extensive tracts of land." It is probably a good species, and quite distinct from *O. Engelmanni;* young plants, raised from Dr. Bigelow's seeds, do not show the peculiar capillary spines of that species mentioned above.

Another *Opuntia* grows on the hillsides and plains near San Diego, *Parry*, and on the sea beach there, *Schott;* an erect plant, 4–6 feet high; spines 2–4 [illegible] pressed yellowish or brownish, also forming large thickets; joints 6–8 inches long and 4–6 inches wide; ovary subglobose, with 16–20 bristly pulvilli; 15–18 broadly obovate cuspidate sepals; about 8 (?) orbiculate petals; 8–10 stigmata; a large yellowish or purple fruit, of pleasant taste, much relished by the inhabitants. Whether this is a form of *O. Engelmanni* or *O. Tuna*, which, from having for a long while been cultivated about the settlements, may have become naturalized, I cannot at present determine.

4. O. MACROCENTRA (sp. nov.): adscendens; articulis magnis suborbiculatis tenuibus sæpe purpurascentibus; foliis gracilibus lineari-subulatis; pulvillis subremotis orbiculato-ovatis setas graciles breves fulvas tomentum griseum vix superantes gerentibus plerisque inermibus, summis et marginalibus solum armatis; aculeis 1–2 rarius pluribus prælongis rectis seu varie flexuosis fusco-atris sursum pallidoribus sæpe annulato-notatis, superiore terete inferiore subbreviore compresso seu canaliculato; flore flavo; ovario ovato; pulvillis 20–25 villosis et fulvo-setosis versus superiorem ovarii partem congestis; sepalis tubi 13 lanceolatis seu interioribus obovatis acuminatis cuspidatisve; petalis sub-8 obovatis obtusis mucronatis; stigmatibus 8; seminibus majusculis late obtuseque undulato-marginatis. (Tab. LXXV, fig. 8.)

Sandy ridges in the bottom of the Rio Grande near El Paso, also on the Limpia, *Wright:* fl. in May.—A remarkably striking plant 2–3 feet high—with large, almost rounded, thinly compressed, often purplish joints, and very long nearly black spines—of which it would be very desirable to obtain living plants, as none of those sent home by Mr. Wright have survived. Joints 5–8 inches long, 4–7 inches wide; leaves 2½–3 lines long, remarkably slender; pulvilli ¾–1 inch apart; lower ones smaller and closer together, unarmed; spines on the upper ones 2–3 inches long, lower half almost black; ovary 1¼ inch long, 8 lines in diameter; flower 3 inches in diameter when fully open. The seeds sent by Mr. Wright as belonging to this species are 2.0–2.2 lines in diameter, much twisted, their border undulating, very similar to seeds of some form of *O. phæacantha*. From this species our plant seems to be distinguished by its larger, thinner, more orbicular joints, the closer and more woolly pulvilli, the slenderer leaves, and the small number of very long spines; the ovary also is more elongated, the sepals narrower, the flower larger.

5. O. PHÆACANTHA, E. in Pl. Fendl.: diffusa, adscendens; articulis obovatis seu suborbiculatis crassis glaucescentibus; foliis e basi crassa subulatis; pulvillis subremotis orbiculato-ovatis setas graciles stramineas seu fuscatas tomento griseo plerumque longiores gerentibus

plerisque armatis; aculeis 2–5 rectis superiore teretiusculo porrecto, cæteris brevioribus inæqualibus plus minus angulatis seu compressis deflexis fuscis seu fusco-atris sursum pallidioribus; flore flavo; ovario brevi pulvillis sub-20 tomentosis et fulvo-setosis versus superiorem ovarii partem congestis; sepalis tubi sub-13 exterioribus late oblanceolatis cæteris late obovatis cuspidatis; petalis 8–10 late obovatis obtusis submucronatis; stigmatibus 8 erectis; bacca cuneato-pyriformi late umbilicata vix pulposa; seminibus plerumque majusculis sub-regularibus crasse marginatis. (Tab. LXXV, fig. 9–13.)

Var. *α.* NIGRICANS: obovata, viridior; pulvillis magis approximatis; aculeis brevioribus acute angulatis nigricantibus.

Var. *β.* BRUNNEA: obovata, glaucescens; pulvillis remotis; aculeis longioribus obtuse angulatis infra brunneis.

Along the Rio Grande near Santa Fé, var. *α. Fendler;* var. *β.* common about El Paso, on the sandy ridges in the immediate valley of the river, *Wright.*—The northern plant has been correctly described in *Plantæ Fendlerianæ*, with the exception of the flower, which probably refers to *O. Missouriensis*, or some allied species. The variety from El Paso has remarkably thick and glaucous joints, which in fall and winter often assume a purplish hue; they are commonly 4 or 5 inches long, and 2½–3 inches wide; the largest ones were 7 inches long, and 4½ inches broad; sometimes they are more orbicular and shorter; leaves 2½–3 lines long, thick in proportion; pulvilli 1–1½ inch apart, with dirty yellowish or brownish bristles; only the lowest ones without spines; spines usually 2–4, sometimes 4 or 5, and even more, in one bunch, 1–2 or sometimes 2½ inches long, terete or more or less flattened, but without sharp angles, often striate, light or dark brown below, whitish above; lower spines often entirely whitish. Flower 2¼–2½ inches in diameter; ovary 10 lines long, 8 lines in diameter; fruit 1¼–1½ inch long, with the lower part contracted, solid and seedless; umbilicus rather shallow; seeds very variable, usually over 2 lines in diameter, but sometimes smaller.

6. O. TENUISPINA, (sp. nov.): diffusa seu adscendens; articulis mediis seu majusculis obovatis basi attenuatis læte viridibus; foliis gracilibus subulatis parvis, pulvillis subapproximatis setas breves graciles fulvas rufasve gerentibus, plerisque armatis seu inferioribus inermibus; aculeis singulis binisve teretiusculis rectis gracilibus flexilibus albidis non raro basi apiceque fuscatis annulatisque, adjectis sæpe inferioribus tenuioribus albis, superiore in areolis superioribus porrecto, cæteris deflexis; ovario clavato gracili pulvillis 25 versus apicem aggregatis griseo-villosis et fulvo-setosis stipato; sepalis tubi sub-13 obovato-orbiculatis abbreviatis cuspidatis; petalis 13 obovatis sub-emarginatis mucronulatis flavis basi aurantiacis; stigmatibus 7–8 erectis virescentibus; bacca minore oblonga profunde umbilicata, seminibus minoribus irregulariter angulatis anguste marginatis. (Tab. LXXV, fig. 14.)

Sand-hills on the Rio Grande, near El Paso, from Doña Ana to San Elizario, *Wright;* fl. May.—About a foot high, spreading; joints 3–6 inches long, 2–4 inches wide; leaves 2 lines long, or less, ½ line in diameter; pulvilli ½ inch, or, in the largest specimens, almost an inch apart, with short grey wool, and bright, reddish-brown, slender bristles, 1–1½ line long; spines stiff and very straight, but flexible; lowest ones ½–1¼ inch long; upper ones 1½–2½, or rarely even 3 inches long, whitish, or, in some species, brown towards the base, or on the lower half, always darkish at tip; flower 2½–3 inches in diameter; ovary 1–1¼ inch long, slender; sepals remarkably short; petals rounded or somewhat emarginate, 1–1¼ inch long, 6–9 lines broad, yellow, with orange-red at base, turning all red on the second day of flowering. Fruit 1–1¼

inch long, with a very deep umbilicus, and without any contraction at base; seeds 1.5–2.0 lines in diameter, deeply notched at the hilum, very irregular. Distinguished from the nearly allied *O. phæacantha* by its thinner joints, slenderer and longer spines, larger flowers, different fruit, &c.

7. O. FILIPENDULA, (sp. nov.): adscendens, glauca; radicibus nodoso-incrassatis tuberiferis; articulis minoribus diversissimis orbiculatis seu obovatis seu oblanceolatis tenuibus; foliis minutis subulatis; pulvillis approximatis in tomento albo setas numerosas tenuissimas penicillatas demum elongatas virescenti-stramineas gerentibus, plurimis armatis seu omnibus plus minus inermibus; aculeis 1–2 albidis elongatis setaceis non raro subangulatis tortisque, 1–2 minoribus sæpe adjectis; ovarii subcylindrici gracilis pulvillis 16–20 villo albo et setis parcis stramineis munitis; sepalis tubi sub-8 lanceolatis, interioribus obovato-cuspidatis; petalis 8 late obovatis retusis purpurascentibus margine pallidioribus; stylo purpurascente; stigmatibus 5 erectis flavidis; seminibus minoribus tumidis anguste crasseque marginatis. (Tab. LXVIII.)

Alluvial bottoms of the Rio Grande, in rather fertile soil, near Doña Ana, above El Paso, and at San Elizario, below it; also on alluvial prairies between El Paso and the Limpia, *Wright:* fl. May and June.—The tubers of the root, ½–1 inch thick, are long and cylindric, or oval, or globular swellings of the roots, strung upon thick fibres; these tubers will sprout when planted. The stems are 6–12 inches high and spreading; joints of a bluish glaucous hue, more so than any other of our species, very variable in shape, orbicular, or even transverse to obovate and lanceolate, often on the same plant, 1½–3 inches long, 1–2 inches wide, very much compressed; leaves 1¼–1¾ line long; pulvilli 4–6 lines apart, with a perfectly white tomentum, becoming grey when old, and numerous slender, greenish-yellow bristles, which finally become 2–3 lines long and very conspicuous. Sometimes the joints are entirely spineless, but usually they are armed with long, deflexed, very slender, white spines; the longer ones 1–2 inches, the lower and shorter ones less than 1 inch in length; ovary slenderer than in any other species known to me, an inch long, at top hardly more than 3 lines wide; flowers about 2½ inches in diameter, purplish, without any mixture of brick-red or yellow, as in the allied species. The only other purple one of our *Platopuntiæ* is *O. basilaris*, which is of a yet purer and deeper purple color. Fruit unknown; seeds have been sent which have germinated and produced plants which already after the first year showed the characteristic glaucous hue and the tuberous roots. These seeds also differ from all our other *Opuntia* seeds by their great thickness, and their remarkably narrow but thick and obtuse margin; they are only very slightly notched at the hilum, and have a diameter of 1.7–2.0 lines, with a thickness of 1.2 lines.

8. O. MACRORHIZA, E. in Pl. Lindh., from between San Antonio and Austin, *Lindheimer*, is apparently well distinguished by its large tuberous roots, which even the young seedlings very soon begin to show; but without these it is hardly distinguishable from *O. Rafinesquii*, E. of the Mississippi valley. I find the flower bud long-acuminate, and the stigmata always 5. (Tab. LXIX.)

9. O. RUFIDA (sp. nov.): erecto-patula; articulis late obovatis seu suborbiculatis pubescentibus; foliis e basi lata subulatis longe acuminatis; pulvillis confertis griseo-villosis setas rufidas graciles numerosissimas penicillatas gerentibus inermibus; floris flavi ovario obovato pulvillis 40–50 instructo; sepalis tubi 20–30 exterioribus lineari-lanceolatis acuminatis, interioribus obovatis cuspidatis; petalis (8?) orbiculato-obovatis obtusis erosis sæpe mucronulatis; stigmatibus sub-7 abbreviatis in capitulum globosum congestis.

Common about Presidio del Norte, on the Rio Grande, on rocks and mountains, *Bigelow*; in the lower valley of the Nazas, southeastern Chihuahua, *Gregg*: fl. May.—Stems 2–4 feet high; joints 2–6 inches long, pale green, without any red or colored spots surrounding the pulvillus, as is said to be constantly the case in the allied *O. puberula* and *O. decumbens*; leaves very slenderly acuminate, 2½ lines long, about twice the length of the axillary wool; pulvilli thickly tomentose, and with an abundance of very delicate brown-red bristles, almost entirely covering the surface of young or not fully-grown joints; in adult ones about 4 lines apart. The flower described above was obtained south of the Rio Grande, in the Bolson de Mapimi; ovary 10 lines long, flower 2½ inches in diameter, stigmata (green?) about one line in length. This species is nearly allied to *O. microdasys*, which is common in cultivation, and specimens of which from Saltillo I have been able to compare. Our plant has more rounded and larger joints, more distant pulvilli, which bear reddish-brown (not yellow) bristles, and longer leaves; from *O. puberula*, which seems to be yet nearer allied to it, it differs by the absence of spines, larger leaves, etc. Mr. Schott has noticed a pubescent *Opuntia* on the dividing ridge of the California Cordilleras, near the boundary line, and a suberect species in the Santa Cruz valley, in Sonora, about 3 feet high, both without spines. It is impossible to form any opinion where they belong, as no specimens have been saved.

10. O. BASILARIS, E. & B. in Pacif. R. R.: found by *Mr. Schott*, in the Gila valley, and up the eastern slope of the Californian Mountains; fl. in May.

11. O. ARENARIA (sp. nov.): diffusa, adscendens; radicibus crassis elongatis sæpe stoloniferis; articulis minoribus obovatis crassis tumidis seu subcompressis tuberculatis nitide virentibus; foliis minutis pulvillo vix longioribus; pulvillis subconfertis parce albo-tomentosis setas plurimas gracillimas pallidas demum in articulis vetustis numerosissimas pulvinatas fulvas gerentibus, omnibus fere armatis; aculeis superioribus 1–4 sæpe subangulatis, summo validiore porrecto albido seu fusco-variegato, cæteris brevioribus divergentibus seu deflexis albidis; aculeis inferioribus 2–6 brevibus setaceis albis radiantibus; floribus sulphureis; ovario obovato pulvillis 20–30 setosis aculeolatisque instructo; sepalis tubi 12–14, inferioribus late obovatis cuspidatis, superioribus obtusis; petalis sub-8 obcordatis seu emarginatis sæpe mucronatis; stigmatibus 5 mucronatis viridibus in capitulum collectis; bacca oblonga ovata; umbilico infundibuliformi aculeolis 3–6 inæqualibus deflexis armata; seminibus magnis irregularibus late crasseque marginatis. (Tab. LXXV, fig. 15.)

Sandy bottoms of the Rio Grande near El Paso, *Wright*: fl. May.—Roots 3–5 lines thick, at last ligneous, far spreading in the loose sand, and sometimes stoloniferous, which I have also noticed in some forms of *O. Missouriensis*; stems spreading 2 or 3 feet, ½–1 foot high; joints 1½–3 inches long, 1–2 inches wide, often terete or rather oval, or clavate, (a specimen before me is 2½ inches long and ¾ inch thick,) and always strongly tuberculate. Leaves about a line long; pulvilli smaller than in *O. fragilis*, very sparingly tomentose, very bristly; the tawny bristles of the old joints covering almost the whole surface. Upper and longer spines 9–15, or even 18 lines long, white, with a yellow tip, or brown, yellow, or reddish at base and tip; other spines 2–6 lines long, white. Flower 2–2½ inches in diameter; ovary 9–12 lines long; filaments greenish-yellow; stigmata nearly 2 lines in length. Fruit dry, 10–14 lines long, contracted at top, with a deeply immersed umbilicus, and with spines of 1–5 lines in length; seeds 2½–3 lines in diameter. This species is nearly allied to the northern *O. fragilis*, but is distinguished by the larger and more strongly tuberculated joints, smaller pulvilli set with numerous bristles, the longer and slenderer spines, and the spinose fruit.

Subgen. 3. CYLINDROPUNTIA.

Articuli teretes, clavati seu cylindrici. Aculei plerumque vaginati.

Flores parvi seu majores. Petala obovata seu orbiculata, rubra seu purpurea, rarius flava. Stigmata 5–8, obtusa.

Bacca umbilicata, sicca seu subsicca, rarissime pulposa; inermis, seu setosa, seu aculeata; floris rudimentis dejectis seu persistentibus.

Semina sutura commissurali cincta, plerumque immarginata.

Embryo circa albumen copiosius subcircularis. Cotyledones contrariæ, incumbentes, haud raro obliquæ, interdum parallelæ, accumbentes.

The species forming this subgenus have an appearance so striking, and at the same time so distinct from the common type of *Opuntiæ*, that a generic separation has been attempted; but the flowers are so entirely identical, and in the fruit so little difference is observed, that it had to be abandoned; the only real distinction, and a permanent one, as far as my observation goes, I find in the embryo; in *Cylindropuntia* it is less curved, not completing an entire circle, and surrounds a more copious albumen; in *Platopuntia*, on the contrary, it is somewhat spirally coiled, and the space for the albumen is thereby much smaller. It is worthy of remark, that in *Cylindropuntia* the direction of the cotyledons is by far less constant than in other *Cactaceæ*; though usually incumbent, as in all other *Opuntiæ*, they are very often oblique, and not rarely accumbent, like to those of *Echinocactus;* in *O. echinocarpa* I have found them invariably so.

§. 1. *Clavatæ.*

Stems prostrate; joints short and clavate, tuberculate, proliferous near the base; the ligneous tissue loosely reticulated much like that of *Platopuntia;* spines more or less compressed and striate, the epidermis not or but slightly separating from them; flowers yellow and rather large; fruit always dry, crowned by the persistent remains of the flower, beset on the pulvilli with numberless spiny bristles.

12. O. PARRYI, E. in Sill. Journ. *Dr. Parry* observed this species on the eastern slope of the Californian Mountains near San Felipe, and sent notes about it, an extract of which I published in Silliman's Journal. Since then *Dr. Bigelow* has collected it 80 or 100 miles northeast of that place, near the Mojave river, and in his report a full account of the plant is given. Dr. Parry describes the joints as 4–8 inches long, ascending, with white spines only 6 lines long; flowers greenish yellow, 1½ inch in diameter; stigmata green.

13. O. EMORYI, (sp. nov.): prostrata; articulis cylindricis basi clavatis glaucis adscendentibus; tuberculis elongatis; pulvillis magnis setas paucas rigidas gerentibus; aculeis plurimis rufis seu fuscis demum cinerascentibus; interioribus 5–9 validioribus triangulatis subcompressis porrectis seu deflexis, superioribus solum suberectis; aculeis exterioribus 10–20 sæpe pluriserialibus undique radiantibus, superioribus gracilioribus teretiusculis, inferioribus rigidioribus compressis; floribus flavis extus rubellis; bacca ovata basi clavata flava pulvillis 35–50 stipata setosissimis, omnibus seu solum inferioribus aculeatis; seminibus numerosissimis valde inæqualibus plerumque transversis indistincte commissuratis. (Tab. LXX—LXXI.)

Arid soil south and west of El Paso, especially between the Sand hills and Lake Santa Maria, *Wright, Bigelow,* in Sonora, *Wright,* and on the lower Gila and in the Colorado desert, *Schott:* fl. August and September.—This is the largest and stoutest of our clavate *Opuntiæ,*

with very numerous and long spines, spreading largely and growing 6–12 inches high; forming a welcome retreat for the smaller Rodentia, snakes, &c., which, under the protection of its powerful spines, are secure against the attacks of their enemies. Joints curved, 4–6 inches long, 1–1½ inch in diameter; the tubercles are 1–1½ inch long, very prominent, and might be termed cylindric if they were not longitudinally attached to the stems. The upper tubercles of each joint and their spines are more fully developed than the others in this, as in all *Opuntiæ*. In those we distinguish four larger central spines; the upper one more erect, the lower one stouter, longer, broader, and deflexed. We often find a second upper one above, and a second lower one below the other, or the four central spines are surrounded by a circle of 6 or 8 somewhat smaller spines, which may be considered as an interior series of radiating ones. The exterior series consists of 10–20 shorter and more slender spines; but the arrangement of spines in this genus is never so regular as it is in other genera, especially in *Echinocactus*. Stoutest spines 1½–2½ inches in length, ¾–1 line wide, striated, flat on the upper, strongly carinate on the lower surface, so as to appear triangular; other interior spines 1-2 inches, exterior ones ¾–1½ inch long. Fruit 2–2½ inches long, an inch in diameter; larger pulvillis 2–2½ lines in diameter; bristles whitish or reddish 3–4 lines long; 10 or 12 spines, 4–8 lines in length, are mixed with the bristles on all or only on the lower pulvilli. Seeds in the same fruit 2½–3 lines in diameter, or more; often transverse, or angular, blunt or beaked; cotyledons generally oblique, sometimes accumbent, contrary to the usual arrangement in this genus. The specimens from the lower Gila and the Colorado must, I have little doubt, also be referred here. Plant 12–18 inches high, far-spreading, of a dull greyish-green color; joints similar to those described above; spines only 1–1½ inch long; flowers sulphur-yellow, externally tinged with purple, 2 or 2½ inches in diameter; pulvilli of the ovary over a line in diameter, white-tomentose, supported by subulate leaves (2 lines long), bearing short white bristles and reddish spines; exterior sepals oblanceolate, cuspidate, red-brown; interior ones with yellow and red petaloid margins; petals yellow, with red tips; fruit not as large, but even more spiny than in the specimens from El Paso. This species, also, has been named in honor of *Col. Wm. H. Emory*, who, in his different expeditions to the extreme southwestern parts of our territory, always exerted himself for the advancement of our knowledge of the natural history of these regions.

14. O. Schottii (sp. nov.): articulis breviter clavatis adscendentibus; tuberculis elongatis; pulvillis paucisetosis; aculeis scaberrimis rubellis, interioribus 4 cruciatis, superiore triangulato erecto, cæteris ancipitibus supra planis subtus convexis, inferiore latiore; aculeis exterioribus 8–10 radiantibus valde inæqualibus; bacca ovata clavata pulvillis 35–40 setas suberectas aculeosque paucos gerentibus; seminibus angulatis rostratis transversis, commissura lineari indistincta. (Tab. LXXIII, fig. 1–3.)

Abundant on the arid hills near the Rio Grande, between the San Pedro and Pecos rivers, *Wright, Schott.*—The specimens gathered in July and September were all in fruit. Joints 2 inches, tubercles 8–9 lines long; pulvilli even in the oldest joints with few bristles; spines rougher than in any other allied species, red; the broader ones with a white margin, 1½–2 inches long; smaller radiating spines 4–9 lines long, almost surrounding the inner one. Ovary with white-tomentose pulvilli and short bristles; those in the fruit become a little longer, but are confined to the upper half of the pulvillus and are erect, while in all the allied species they are much more numerous and stellately spread in all directions. Seed a little over 2 lines in the

transverse diameter; cotyledons in all the seeds examined oblique. Dedicated to one of its discoverers, whose name I have often had occasion to mention.

Dr. Gregg has sent a similar plant from San Luis Potosi, Mexico, which, though growing 7 or 8 degrees farther south, I must consider the same as *O. Schottii*. Its joints 2 inches long; tubercles 10–12 lines long; 4 central spines ancipital or triangular, 12–20 lines long, much less rough, 8–12 exterior spines of very different sizes. (Tab. LXXIII, fig. 4.)

15. O. GRAHAMI (sp. nov.): radicibus crassis fusiformibus; articulis breviter clavatis adscendentibus læte viridibus; tuberculis oblongis; folii e basi ovata abrupte acuminatis; pulvillis albo-tomentosis setas demum numerosas elongatas rigidas gerentibus; aculeis gracilibus scabris rubellis demum cinereo-fuscis, interioribus 4–7 robustioribus scabris teretiusculis seu 4-angulatis seu rarius compressis, exterioribus 4–6 multo minoribus; flore flavo; ovarii pulvillis sub 30 albo-tomentosis setosis; bacca ovata setosissima; seminibus regularibus vix rostratis, commissura lineari indistincta. (Tab. LXXII.)

Sandy soil in the bottom of the Rio Grande, near El Paso, and for a distance of about 100 miles along the river, *Wright, Bigelow;* fl. June.—Roots often 6 inches long and an inch thick, tapering, single or divided; joints 1½–2 inches long, ¾ or at most 1 inch in diameter; tubercles 6–7 lines long; leaves similar to those of *O. vulgaris*, short and thick; nearly a line in diameter at base and about twice as long. Larger spines 1½–2 inches long and spreading, scabrous, slenderer than in any allied species. Flowers apparently 2 inches in diameter, and, like the fruit, very similar to those of *O. clavata;* seeds 2.5–2.8 lines long, with a linear and often very indistinct commissure; cotyledons in the seeds examined regularly incumbent. This species, peculiar to an interesting part of our boundary, has been named in honor of the gentleman who was for a time chief of the scientific corps of the Commission, and by whose orders this, with many other species of *Cacti*, has been sent to me.

16. O. BULBISPINA (sp. nov.): radicibus fusiformibus; articulis parvis ovatis vix clavatis sæpius ex apice proliferis fragilibus; pulvillis parce setosis, junioribus laxe villosis; aculeis teretiusculis scabrellis basi bulbosis, interioribus 4 cruciatis, inferiore longiore, exterioribus 8–12 radiantibus. (Tab. LXXIII, fig. 5–6.)

Near Perros Bravos, north of Saltillo, *Gregg.*—Spreading masses 2–4 feet in diameter; joints 9–12 lines long, 6 lines in diameter, often proliferous at the upper end; tubercles 3–4 lines long; interior spines 4–6 lines, exterior ones 1½–3 lines in length. This species has the subcylindric joints, the reticulated ligneous texture, and the scabrous spines of the clavate *Opuntiæ*, but its mode of ramification is rather different, and the form of the joints is more ovate than clavate. Perhaps it belongs rather to Prince Salm's section *Glomeratæ*, and near *O. pusilla* from South America.

§ 2. *Cylindricæ.*

Stems ascending or usually erect, much branched; joints cylindric or tumid, tuberculate or sometimes almost smooth; the ligneous tissue is compact, and either (in spec. 17–24) forms a reticulated hollow tube, in which the meshes correspond with the tubercles, and which by age becomes more and more solid and massive, or it is (in spec. 25–28) reticulated only when quite young, and soon becomes quite dense. The spines are almost always terete, and are always covered with a loose glistening sheath. Flowers purple or rarely yellow, large, or usually middle sized or (in the two last species) quite small. The fruit is unarmed, somewhat fleshy or

leathery, rarely pulpy, throwing off the dead flower, or very rarely retaining it. In a few species it is dry and spiny.

17 O. ECHINOCARPA, E. & B. in Pacif. R. R. Var. β. MAJOR: elatior; articulis elongatis basi attenuatis; tuberculis oblongo-linearibus; setis tenuibus penicillatis; aculeis longioribus laxius vaginatis paucioribus; bacca globosa seu basi clavata pulvillos pauciores gerente.

In the deserts on both sides of the Colorado, and in Sonora, *Schott.*—This form looks very different from the plant collected by Dr. Bigelow, and described in the report of Captain Whipple; but the very peculiar seeds which fortunately have been obtained by both collectors prove them to be identical. Dr. Bigelow's plant is a low straggling shrub; but Mr. Schott's is 4 or 5 feet high, with divaricate branches, joints 8–10 inches long, with elongated tubercles, (6–9 lines in length,) fine long bristles, and longer spines with looser sheaths. The 4 central larger spines are 1–1¼ inch long; the 4–8 radiating spines on the contrary shorter; the first is longer and bears only about 25 pulvilli, as spiny as in the original form.

18. O. SERPENTINA, E. in Sill. Journ., 1852: diffusa; ramis elongatis subverticillatis divaricatis adscendentibus; tuberculis prominentibus ovatis; pulvillis albido-setosis; aculeis 7–9 vaginatis albidis seu rufescentibus porrectis, infimis deflexis; floribus minoribus flavis extus rubellis; ovario depresso pulvillis sub-20 stipato; sepalis 10 late obovatis breviter cuspidatis; petalis sub-5 obovatis integriusculis mucronatis; stigmatibus 8 erectis; bacca sicca subhemisphærica villosa aculeatissima late et profunde umbilicata flore emarcido sæpe coronata.

Dry hills near San Diego, California, *Parry*, generally nearer the seacoast than *O. prolifera*, and not gregarious, nor so common as that species, *Schott.*—Stems 1–1½ inch in diameter, suberect, 4–5 feet high, or almost prostrate; joints 6–12 inches long, ¾–1¼ inch thick, somewhat verticillate, divaricate; spines 3–9 inches long, sheathed, light yellowish, or rusty, upper ones stellate-divaricate, lower one closely deflexed. A single flower was collected by Mr. Schott in October; it is not quite 1½ inch wide, the ovary depressed, about 8 lines high with 20 areolæ bearing dirty yellowish wool, yellow bristles, and 5–7 reddish brown sheathed spines, 2–4 lines in length; sepals externally yellowish-green, tinged with purple; even the lower ones unusually obtuse or short cuspidate; petals rounded scarcely 9 lines long, yellow above, red at tip, ascending and forming a cup-shaped corolla; stigmata (green ?) 2 lines long. Fruit saucer-shaped, deeply and broadly umbilicate, yellowish-brown, very spiny, and "long woolly."

19. O. PROLIFERA, E. l. c.: caule arborescente; ramis numerosis horizontalibus divaricatissimis; articulis ovatis seu ovato-cylindricis tumidis fragilibus versus ramorum apicem congestis perviridibus, inferioribus demum refractis brunneis; tuberculis obovato-oblongis prominulis; pulvillis ovatis tomentosis, vetustioribus stramineo-setosis; aculeis 8–10 obscuris stramineo-seu rufo-vaginatis, singulo subcentrali, cæteris patulis stellatis, inferioribus brevioribus; flore rubro; sepalis late ovatis; petalis oblongo-obovatis; stigmatibus erectis; bacca ovata umbilicata aculeolata sæpissime sterili proliferaque.

On arid hills about San Diego, California, near dry beds of streams, forming impassable and extensive thickets, *Parry, Schott.*—These thickets are likened by Mr. Schott to unapproachable coral reefs. Stem 2–4 and sometimes even 6–7 inches thick, and 3–10 feet high; the wood forms a reticulated hollow tube with short meshes, which in old plants finally become obliterated. The tumid joints are 3–6 inches long, 1½–2 inches in diameter, clustered at the end of

the branches; the younger ones easily break off and stick to the skin of men or animals. The tubercles are obovate, narrowed below, and about 6 lines in length, arranged in 5 or 8 spirals; areolæ oval, somewhat immersed, with bunches of fine straw-colored bristles at the upper edge. Spines very variable, always with large loose sheaths; in a specimen before me I find 7–8 radiating spines; the upper ones and the central one equal, about 12–14 lines long; the lower ones 6–8 lines long, with a few still smaller ones below; in other specimens the upper spines are reduced in size or are wanting; flowers dark-red, salverform, about 1½ inch in diameter; fruit said to be spinulose, but always abortive, as Dr. Parry has often satisfied himself, and usually proliferous. This species somewhat resembles *O. arborescens*, but is easily distinguished by the short and tumid joints, short tubercles, spiny fruit, etc. The alliance with the next species and with *O. Bigelovii* is much closer. They represent the same type east of the California mountains that this does on the Pacific coast; just as *O. echinocarpa* in the Colorado valley represents another type which has on the coast its representative in *O. serpentina*.

20. O. FULGIDA (sp. nov.): caule erecto arborescente flexuoso; ramis numerosis divaricatis; articulis ovatis seu ovato-cylindricis tumidis glaucescentibus ad ramorum apicem congestis; tuberculis ovato-oblongis sub-prominulis; foliis ovatis cuspidatis; pulvillis pulvinatis ovatis tomentosis setas pallide stramineas et aculeos 7–9 subæquales laxe vaginatos undique porrectos stellatos gerentibus; floris parvi purpurei ovario ovato pulvillis 25–30 albo-tomentosis prædito setis aculeisque destituto; sepalis tubi 8–10 orbiculatis obtusis crenulatis; petalis 8, exterioribus cuneatis retusis crenulatis, intimis lanceolatis acutis cætera superantibus; stigmatibus 5 erectis; bacca ovata pulposa vix tuberculata plane umbilicata sæpissime sterili et fasciculatim prolifera; seminibus parvis irregulariter angulatis rostratis anguste commissuratis; cotyledonibus regulariter incumbentibus. (Tab. LXXV, fig. 18.)

Throughout all the Sierras in western Sonora, named by the inhabitants "Vela de Cojote," whence the specific name, which however would be just as appropriate for most other cylindric *Opuntiæ*, which are often visible for several miles when the sun strikes the glistening sheaths of their spines: fl. in July and August.—Stems 5–12 feet high, flexuous with few divaricate branches; joints clustered at their ends, 3–8 inches long and often 2 inches in diameter; "dull grayish, inclined to olive"; tubercles ovate-elongate, 6–7 lines long; leaves thick and only about 1 line long; spines almost equal in length, (1–1¼ inch,) stellate and not much deflexed; completely hiding the surface of the young joints; ovary about 10 lines long; flower cup-shaped, mostly less than an inch in diameter; fruit a plump fleshy berry, oval, rounded, not or only slightly tuberculated, 1–1¼ inch long, a little less in diameter, and entirely spineless; characterized by the large white tomentose pulvilli. Seeds 1–1½ line in diameter, or with the beak often 2 lines long, much compressed, and thin and very angular, often oddly shaped. The fruit is not rarely sterile and proliferous, and becomes pendulous from the weight of the young sprouts attached to it.

21. O. WHIPPLEI, E. & B. in Pacif. R. Rep., var. β SPINOSIOR: elatior, erecta; articulis cylindricis; tuberculis ovatis confertis; pulvillis parce tomentosis, vix setosis; aculeis 12–14 stramineo-vaginatis stellato-porrectis; flore rubro; ovarii ovati tuberculati pulvillis 20–30 albo-tomentosis setas stramineas et aculeolos paucos mox deciduos gerentibus; sepalis 8 orbiculatis cuspidatis; petalis 8–10 spathulatis cuspidatis; bacca subglobosa leviter tuberculata inermi; seminum commissura lineari.

From the Gila south to the Santa Cruz river and Tucson, and further east, *Schott:* fl. in June.

—Stems 6–10 feet high; joints 4–12 inches long, ½–¾ inch thick, covered with ovate or rather rhombic tubercles. Spines much more numerous in this variety than in the original form, found by Dr. Bigelow farther north, 6–9 lines long. Flowers 1¼–1½ inch wide, cup-shaped; seeds nearly 2 lines in diameter, larger than in the northern form, with a very sharply marked linear commissure.

22. O. ARBORESCENS, E. in Wisl. Rep.: caule arborescente erecto reticulato-lignoso; ramis verticillatis horizontaliter divergentibus seu pendulis; articulis verticillatis plerumque ternis quaternisve cylindricis perviridibus; tuberculis elongatis cristatis; foliis teretibus elongatis patulis; pulvillis ovatis pulvinatis breviter tomentosis vix setosis; aculeis 8–30 corneis seu fuscis stramineo-vaginatis undique stellato-porrectis, 1–8 interioribus longioribus laxius vaginatis, centrali sub-deflexo, exterioribus debilioribus arcte vaginatis; flore purpureo magno; ovarii subglobosi tuberculati pulvillis 20–25 breviter tomentosis setas minutas et aculeolos paucos erectos deciduos gerentibus; sepalis tubi 8–13 obovatis obtusis medio virescentibus margine purpureis; petalis 1012 obovatis obtusis retusisve; filamentis purpureis; stigmatibus 8; bacca globosa seu hemisphærica tuberculis prominentibus cristata late umbilicata inermi subsicca flava; seminibus regularibus anguste commissuratis; cotyledonibus incumbentibus seu rare obliquis. (Tab. LXXV, fig. 16–17.)

This species extends from the upper waters of the Arkansas and the Platte rivers deep into Mexico, and from the plains east of the Llano Estacado (200 miles east of the Pecos) to Zuñi, 150 miles west of the Rio Grande, about 15 degrees of latitude and 8 of longitude: fl. May and June.—North and east this species is only about 5 feet high, but further south it is said to become 20 or 30 feet high. Even the old trunks continue greenish and spiny; the massive ligneous skeleton is always characterized by the elongated-rhombic meshes and the verticillate insertions of the branches; in very old specimens the cavity of the tube and the meshes become almost obliterated by the filling in of ligneous layers. The roots are often somewhat tuberous by a swelling of the fibres. Joints 2–6 inches long, less than an inch in diameter; tubercles compressed-cristate, elevated, 7–9 lines long; leaves 6–10 lines long, hardly a line in diameter; spines very variable in number and size; sometimes we find only 8–12 spines, not half an inch long, so that the plant from a distance appears spineless; but more frequently 20–25, or even more spines occur, the longest middle ones deflexed, and 8–10, or rarely 12–14 lines in length, other spines spreading all around, 4–8 lines long. The beautiful purple flowers are 2½–3 inches in diameter, and often profusely cover the tree; the stigmata have a length of 3 or 3½ lines. The fruit is about an inch long in all dimensions; umbilicus wider or narrower, shallower or deeper, according to the greater or smaller prominence of the upper tubercles of the fruit. Seeds 1½–2 lines in diameter, usually of a regular shape, with little or no beak; the commissure distinct, and between 0.1 and 0.2 line broad; cotyledons almost always regularly incumbent, rarely somewhat oblique. Sometimes 3 cotyledons are observed in the seeds of this species, as is also the case in many others.

23. O. MAMILLATA, A. Schott in litt.: caule arborescente reticulato-lignoso divaricato-ramosissimo; articulis ovato-cylindricis crassis abbreviatis retusis perviridibus; tuberculis ovatis tumidis prominentibus; foliis ovatis abbreviatis cuspidatis; pulvillis ovatis albo-tomentosis setas brevissimas seu nullas gerentibus; aculeis 4–6 gracilibus brevibus arcte vaginatis stramineis, plerisque deflexis; flore parvo purpureo; ovarii ovati pulvillis 18–24 pulvinatis albo-tomentosis; sepalis tubi sub-8 orbiculatis; petalis 8 late obovatis abbreviatis; filamentis exterioribus

dilatatis (sterilibus?); stigmatibus 7–8 erectis; bacca ovata plane umbilicata pulvillis magnis albo-tomentosis inermibus notata; seminibus parvis angulatis vix rostratis anguste commissuratis valde compressis. (Tab. LXXV, fig. 19.)

South range of the Sierra Bubuquibari, in Sonora, and southeastward, in fertile valleys, *Schott:* fl. July and August.—This peculiar species is more tree-like than any other Sonorian *Opuntia*. It has a distinct trunk and a dense top, much like any other ordinary tree, though only 5 or 6 feet high; the joints are 3 or 4 inches long, and 1½ inch in diameter; the swelling tubercles much resemble those of a *Mamillaria*, whence the name; the thick leaves are scarcely a line long; spines few, 3–9 lines long, sometimes almost wanting. The flowers are hardly an inch in diameter, and of a bright pink or purple color; the ovary is 8 or 9 lines long, and the fruit of the same length, slightly tuberculate, in all the specimens before me unarmed, (according to Mr. Schott's notes, "spiny.") Seeds 1–1½ line in each dimension, often higher than broad, very irregular, remarkably similar to those of *O. fulgida*, but scarcely beaked, and still more compressed; cotyledons incumbent, or often somewhat oblique.

24. O. Thurberi (sp. nov.): frutescens, erecta; articulis cylindricis gracilioribus tuberculatis; tuberculis oblongo-linearibus minus prominulis; pulvillis sub-orbiculatis breviter fulvo-tomentosis vix setosis; aculeis 3–5 brevibus obscuris stramineo-seu fulvo-vaginatis lateraliter divergentibus, infimo robustiore deflexo; flore miniato; ovarii clavati tuberculati pulvillis 18–20 tomentosis brevissime setosis et parce aculeolatis; sepalis tubi obovatis cuspidatis; petalis erectiusculis obovato-spathulatis obtusis retusisve; stigmatibus 7 brevibus crassis erectis.

Near Bacuachi, Sonora, *G. Thurber:* fl. in June.—Similar in some respects to *O. arborescens;* but the slender joints only about 6 lines in diameter; tubercles 9 lines long, spines 3–8 lines long, the lowest one the stoutest! and deflexed. The ovary is about 10 lines long and bears on some of the pulvilli 1 or 2 spines, which are evidently deciduous, as we see them in *O. arborescens* and *O. Whipplei;* the flower is 1½ inch in diameter, dull brick red, salver form, and opens much less than that of *O. arborescens*, which is pure purple; stigmata 1–1½ line long. This species I have named for its discoverer, Mr. George Thurber, who, in Mr. Commissioner Bartlett's party, traversed Sonora, and gathered many interesting plants in that then almost unknown country.

25. O. Wrightii (sp. nov.): caule frutescente erecto, juniore reticulate, seniore compacto-lignoso; ramis adscendentibus; articulis cylindricis gracilibus sub-tuberculatis; tuberculis elongatis depressis; foliis elongatis subulatis patulis; pulvillis orbiculatis albo-tomentosis setas gracillimas penicillatas gerentibus; aculeis singulis (seu rarius 1–2 superioribus minoribus adjectis) porrectis seu paullo deflexis e cinereo rubellis vagina straminea decidua indusiatis; flore miniato; ovarii obovati pulvillis 15–18 albo-tomentosis setosisque; sepalis tubi 9–12 orbiculatis, exterioribus cuspidatis, interioribus obtusis; petalis sub-8 late obovatis emarginatis; styli crassi stigmatibus 6–7 brevibus adpressis.

Common on steep rocky mountain sides on the Limpia, *Wright*, and along the Rio Grande from Presidio del Norte to the Pecos, *Parry, Bigelow;* also southward, in Mexico, *Gregg:* fl. June and July.—A shrub, 2–4 feet high, about 1 or 1½ inch thick below, intermediate between *O. arborescens* and *O. frutescens* in size, structure of stem, and arrangement of spines; branches few; joints 4 lines in diameter; tubercles flat, 7–9 lines long; leaves about 5 lines long; spines 8–10 lines in length, generally single or with 1 or 2 small and divergent ones above; in one specimen before me those upper spines are almost as stout and long as the lower one; flowers about 1 or 1½ inch in diameter; ovary 7–8 lines long; fruit unknown.—This

pretty species of *Opuntia* bears a name which has been often mentioned in these pages, and which is forever inseparably connected with the botany of our Southern boundary.

26. O. ARBUSCULA, (sp. nov.): caule erecto arborescente dense lignoso apice ramosissimo capitato; ramis divaricatis elongatis teretibus etuberculatis; articulis junioribus læte viridibus leviter tuberculatis; tuberculis oblongo-linearibus depressis; pulvillis magnis orbiculatis albo-tomentosis; setis parcis gracillimis penicillatis; aculeis singulis (seu subinde binis lateralibus) porrectis demum deflexis stramineo- seu fulvo-vaginatis, rarius uno alterove breviore inferiore deflexo adjecto; flore flavo-virescente; ovarii clavati pulvillis 16–18 albo-tomentosis vix setosis; sepalis tubi sub-8 orbiculatis cuspidatis seu mucronatis; petalis sub-5 spathulatis, staminibus extus in staminodia latiora subulata transeuntibus; stigmatibus 5 brevibus erectis.

On the desert heights, near Maricopa village, on the Gila, *Schott*: fl. in June.—A truly arborescent species, 7–8 feet high, with a solid, ligneous trunk, 4–5 inches thick, smooth green bark, and a top formed by the numerous slender and divaricate branches; ultimate joints 2–3 inches long, about 4 lines in diameter; tubercles flat and indistinct, about 6 lines long; spine 9–12 lines long. Ovary, in my specimen, 10 lines long and only 4 lines in diameter, without any spines; but the fruit is described by Mr. Schott as "bristly, crowned by the persistent flower." Flower apparently nearly 1½ inch in diameter; petals few, 9 lines long and 4 lines broad, greenish-yellow, tinged with red. Stamina and staminodia (perhaps what I consider so are but the broader filaments of the exterior fertile stamens) finally breaking off near their base, leaving a rough surface. The name of this species indicates a small tree.

27. O. FRUTESCENS, E. in Pl. Lindh. was collected abundantly in all western Texas and southern New Mexico. For a fuller account and a figure, see Engelmann and Bigelow's paper on the *Cactaceæ* of Captain Whipple's Pacific Railroad Exploring Expedition Report.

28. O. TESSELLATA, E. in Pacif. R. R. (O. ramosissima, *E. in Sill. Journ.* 1852).—This curious species was first noticed by *Dr. Parry*, and described, as above cited, in an account of his Californian *Cactaceæ*, under the name of *O. ramosissima*, which being deemed an improper name in a section where all could claim it with equal, and some with greater justice, it was changed in the account of *Dr. Bigelow's* plants, who brought specimens of the wood, the branches, and the fruit. Mr. Schott, the third botanist who collected it, was fortunate enough to find the flowers. Living plants are yet a desideratum in our gardens.

This species grows in arid sandy soil, from the Sierra Madre south of the Gila to the lower Colorado, Bill Williams's fork, and the Californian Mountains. Mr. Schott found it in September with flower and ripe fruit. The flower is purple, about 6 lines in diameter; the clavate ovary is of the same length, and bears 40 or 50 very tomentose but scarcely spiny or bristly pulvilli; the 5 petals are almost orbicular; the exterior filaments are broad and persistent (sterile staminodia?); 5 stigmata short and erect. The fruit resembles very much those of the clavate *Opuntiæ;* it is 9 or 10 lines long, dry, ovate, and contracted above; the narrow and deep umbilicus contains the remains of the flower, the above-mentioned broad filaments being most conspicuous; externally it is covered with a profusion of hair-like flexuous bristles of a red-brown color, 2–3 lines in length, mixed with dense wool. Seeds thick, with a broad spongy commissure, 1.8–2.0 lines in diameter. Mr. Schott collected in May other greenish-yellow flowers, from similar bushes, which he considers as of a distinct variety; the ovary in these flowers appears elongated, and is probably sterile, and would have become persistent and proliferous, as we find it in many other *Opuntiæ;* so that this green-flowered form probably is not a variety of our species, but a degeneration.

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EXPLANATION OF PLATES.

REMARKS.—All the figures are in natural size unless otherwise stated. The seeds of Mamillariæ, Echinocacti, and Cerei are represented in the natural size, and eight times magnified: *a* is a lateral view, natural size; *b*, same, eight times magnified; *c*, part of the surface of the seed still more magnified; *d*, seed after the removal of the outer coat, with endopleura and albumen; *e*, embryo; *f*, another form of same seed; *g*, seedling plant; *h*, back view; *i*, front view; *k*, basal view; *l*, top view of embryo—all eight times magnified.

The seeds of Opuntiæ, being larger, are represented: *a*, side view, natural size; *b*, same, four times magnified, as are all the following ones; *c*, posterior view; *d*, anterior view; *e*, vertical section; *f*, seed after the removal of the testa; *g*, embryo.

The landscape opposite the title-page represents a region near the Colorado river, with several *Cacti*, especially *Cereus giganteus;* one of them decayed, showing the form of the ligneous skeleton. The different plants are accurate copies of nature.

PL. 1. MAMILLARIA MICROMERIS: 1, a young plant not yet blooming, without the tuft; 2, a plant in bloom, with the tuft; 3 and 4, different views of a plant of the largest size; several fruits are seen in the tuft; 5, a tubercle with a bunch of spines, eight times magnified; 6, a bunch of spines in natural size, and 7 the same, eight times enlarged.

PL. 2. *The same:* 1, lateral view of a bunch of spines, and its wool on the flower-bearing part of the plant, eight times magnified, exhibiting the upper elongated clavate spines; 2, flower, four times enlarged; 3, fruit; 4, seed.

FIG. 5–8. MAMILLARIA MICROMERIS var. GREGGII: 5, bunch of spines; 6, same, eight times magnified, showing the ragged ends of the long spines where they are broken off; 7, a bunch of spines, with its wool from the flowering part of the plant, with the long clavate spines, eight times magnified; 8, seed.

PL. 3. MAMILLARIA LASIACANTHA: 1, a plant of the ordinary size in flower; 2, flower, four times magnified; 3, a tubercle with a bunch of spines, showing the pubescence, eight times magnified; 4–5, bunches of spines, natural size, and eight times magnified.

PL. 4. MAMILLARIA LASIACANTHA var. DENUDATA: 1, a fruit-bearing plant; 2, a tubercle, with its bunch of spines, eight times magnified; 3–4, bunches of spines, in natural size, and the same eight times magnified; 5, seed.

PL. 5. MAMILLARIA PUSILLA var. TEXANA: 1, whole plant in flower; 2, a tubercle, with a bunch of spines and the axillary wool, twice magnified; 3, a bunch of spines, same; 4, flower, same; 5, fruit natural size; 6, seed.

PL. 6, FIG. 1–8. MAMILLARIA GRAHAMI: 1, a single plant; 2–4, bunches of spines, with one, two, and three central spines; 5, a tubercle and bunch of spines, magnified twice; 6, a bunch of spines from Dr. Parry's specimen from the Colorado, also magnified twice; 7, a flower from A. Schott's specimen from the Gila; 8 seed.

FIG. 9–12. MAMILLARIA BARBATA: 9, a tubercle and bunch of spines, natural size; 10, bunch of spines, magnified twice; 11, fruit; 12, seed.

PL. 7. MAMILLARIA PHELLOSPERMA: 1, a flowerless plant; 2, a bunch of spines; 3, a tubercle with the axillary wool and bristles, and the terminal bunch of spines twice magnified; 4–6, bunches of spines with one or more hooks, twice the natural size; 7–8, fruits of different size; 9, seed.

PL. 8, FIG. 1–8. MAMILLARIA WRIGHTII: 1, a whole plant in fruit, from a sketch of Mr. Moellhausen's; 2, a young, and 3, an old tubercle with spines of the same specimen; 4–6, spines of a specimen from the Copper mines, four from the older part of the plant; 7, flower; 8, seed.

FIG. 9–14. MAMILLARIA GOODRICHII: 9, tubercle with spines; 10, bunch of spines, natural size; 11–12, tubercles with the axillary wool and bristles, and the spines; 13–14, bunches of spines; the last four figures are magnified twice.

PL. 9, FIG. 1–3. MAMILLARIA MELACANTHA: 1, whole plant in flower; 2, fruit; 3, seed.

FIG. 4–14. MAMILLARIA HEYDERI, var. APPLANTA: 4, upper part of plant in flower and fruit; 5–6, different views of flowers; 7, fruit; 8, seed, all from the same specimen from El Paso; 9–14, bunches of spines of different forms, of the same variety, from western Texas.

FIG. 15–17: bunches of spines and seed of the var. HEMISPHÆRICA, from Matamoras.

FIG. 18–20. MAMILLARIA GUMMIFERA: different views of tubercles and spines.

PL. 10. MAMILLARIA ECHINUS: 1, whole plant in fruit; 2–3, tubercles showing the groove and the wool on the basal areola; 4–7, bunches of spines of younger and older plants; 8–9, same, with the central spine curved; 10, fruit; 11, seed.

PL. 11. MAMILLARIA PECTINATA: 1, whole plant in flower; 2–3, different views of tubercles from the sides of the plant; 4–7, bunches of spines; 8–9, tubercles from the flower-bearing top of larger plants; 10, seed.

PL. 12, FIG. 1–16. MAMILLARIA TUBERCULOSA: 1, a large specimen in fruit; 2–11, tubercles and bunches of spines of different specimens; 2–3, from a young plant; 10, a very young tubercle; all the tubercles exhibit the large mass of dense wool at base; 12, flower bud; 13, flower; 14, fruit; 15, seed of the same; 16, seed of another specimen, smaller, and with smaller marks.

FIG. 17–22. MAMILLARIA DASYACANTHA: 17–20, tubercles and bunches of spines of different specimens; 21–22, seeds of the same.

PL. 13. MAMILLARIA RADIOSA, var. NEO MEXICANA: 1, a plant with several branches in flower; 2 and 3, different tubercles with bunches of spines, the woolly grooves extending more or less down along the upper side of the tubercle; 4, a bunch of spines; 6, a fruit; 7, seed.

PL. 14. MAMILLARIA MACROMERIS in flower.

PL. 15. *The same:* 1, one of the largest bunches of spines; 2, one of the smallest ones; 3, a young tubercle not fully developed; 4, a young, but full-grown tubercle, bearing the flower at the lower end of the woolly groove, far above the axil; a younger tubercle attached to it; 5, a ripe fruit with a few scales; 6 and 7, seeds of the largest and the smallest kind.

PL. 16. MAMILLARIA FISSURATA: 1, a flowering plant; 2, petals; 3, nine tubercles of different size and age, and in different positions; 3, a large tubercle from above; 4, same from below; 5, same from the side; 6, a smaller one, with fewer divisions from above; 7, side view of same;

8, a small tubercle from above; 9, a young one with the silky wool yet straight and smooth; 10, a young tubercle bearing a fruit, which becomes visible after separating the wool; 11, seed.

Pl. 17, Echinocactus Scheerii: 1, a full-grown plant in flower; 2, part of a rib, front view, showing the form of the tubercles and their grooves; 3, part of a rib, side view; 4–6, bunches of spines; 7, seed.

Pl. 18. Echinocactus brevihamatus: a full-grown plant of ordinary size.

Pl. 19. *The same:* 1, part of a rib, side view, to exhibit the tubercles and their grooves; 2, part of a rib almost in front, with a flower; 3, a tubercle with a flower at the base of the long groove; 4, a young bunch of spines from a small specimen; 5–8, bunches of spines from different full-grown specimens.

Pl. 20. Echinocactus setispinus: 1, top of a plant with flower; 2, another flower; 3, flower bud; 4–6, bunches with twelve radial and one central spine of different size and shape; 7–9, bunches with more radial, and sometimes more central spines; 10, bunch of spines with two almost straight central spines; 11, fruit; 12, several seeds attached to the funiculi, four times magnified; 13, seed of the usual size and form; 14, larger seed of a specimen from Eagle Pass, to which spines fig. 8, belong.

Pl. 21. Echinocactus longehamatus: part of a rib with a flower.

Pl. 22. *The same,* a rib, side view, showing the tubercles, and with their short grooves and their flexuous spines.

Pl. 23. *The same:* 1, a bunch of spines of the longest spined variety; 2, a fruit; 3, seed; 4 and 5, bunches of spines of the smaller variety.

Pl. 24. *The same:* 1, a bunch of spines of the thick spined Mexican form; 2 and 3, lower central spines of the same; 4, seed of the "*Limas agrias,*" the sour cactus-berries of Saltillo, to exhibit the peculiar form of the seed, and the great favosity of the surface.

Pl. 25. Echinocactus Wislizeni: 1, upper part of a rib with a flower and a flower bud; 2, pistil; 3, fruit; 4 and 5, seeds of different form and surface, from El Paso; 6, seed of different shape, from the upper Gila.

Pl. 26. *The same:* 1–3, bunches of spines of different shape and proportion.

Pl. 27. Echinocactus Le Contei: 1, part of a rib with a fruit; 2, a bunch of spines; 3, a flower; 4, section of same; 5, seed.

Pl. 28. Echinocactus Emoryi: 1, bunch of spines of a large specimen, from Guaymas; 2, young bunch of spines with flower, from Sonora; 3, section of flower.

Pl. 29. Echinocactus viridescens: 1 and 2, bunches of spines of a young plant; 3, flower; 4, pistil; 5, fruit, not fully ripe and therefore a little shrivelled; 6, seed.

Pl. 30. Echinocactus cylindraceus: 1, a bunch of spines of a young specimen; 2–5, bunches of spines of older, but not yet fully grown specimens.

Pl. 31. Echinocactus horizonthalonius, in flower.

Pl. 32, fig. 1–5, *the same;* 1, a young plant; 2–4, spines of different forms; 5, seed.

Fig. 6–7. Echinocactus Parryi, bunches of spines.

Pl. 33. Echinocactus Texensis: 1, a larger; 2, a smaller bunch of spines; 3, flower; 4, fruit; 5, seed from Texas; 6, seed from Matamoras, smaller and more distinctly marked than fig. 5.

Fig. 7. Seed of Echinocactus Sandillon, *Gay,* from Chili, which has also a woolly fruit.

Pl. 34. Echinocactus intertextus: 1, a plant of rather large size, in flower; 2–5, young

bunches of spines, more or less developed; 6–8, old bunches of spines; 9, fruit, with a few scales, with wool at base and the dry flower on top; 10, seed.

Pl. 35, fig. 1–5. Echinocactus intertextus, var. dasyacanthus: 1, 1–2, young bunches of spines; 3–5, old ones.

Fig. 6–8. Echinocactus unguispinus, bunches of spines.

Pl. 36. Cereus viridiflorus: 1, large plant from the Limpia in flower, one flower fully, another one half open; 2, bunch of spines of this plant without, and 3 with a central spine; 4–7, bunches of spines of a specimen collected by Dr. Bigelow on the upper Pecos, with 1 or more central spines; 4, a very young bunch; 5, a full grown one; 6, a similar larger one like the former, with 2 central spines; 7, another one, with the largest central spine curved upwards; 8–10, bunches of spines with and without a central spine, from plants collected by Dr. Wislizenus in northeastern New Mexico; 11, part of a plant in flower, with very obtuse petals and very small spines, collected by A. Fendler at Santa Fé; 14, fruit from Santa Fé; 15, seed of the same; 16, fruit from the Limpia.

Pl. 37. Cereus chloranthus in full bloom.

Pl. 38. *The same:* 1, top view, exhibiting the rays formed by the central spines; 2–7, different bunches of spines; 8, a small fruit; 9, one of usual size; 10, seed of common size; 11, smaller seed.

Pl. 39. Cereus dasyacanthus, a simple, branchless plant, with one flower.

Pl. 40. *The same:* bunches of spines, different in size, number, and proportion of the spines; all twice magnified.

Pl. 41, fig. 1–2. *The same:* 1, fruit; 2, seed.

Fig. 3–5. Cereus Roetteri: 3–4, bunches of spines, magnified twice; 5, a fruit.

Pl. 42. Cereus ctenoides: 1, a large specimen in flower; 2–3, front view and lateral view of a bundle of spines, twice magnified; 4, top part of another specimen, in which the spines are not so closely pectinate; 5–6, spines of this specimen, twice magnified.

Pl. 43. Cereus cæspitosus: a specimen of one of the largest forms; petals unusually curled.

Pl. 44. *The same:* 1–4, spines of the larger form, in different states of development, magnified twice; 5–7, spines of the smaller form, also magnified twice; some of the bunches show rudiments of central spines; 8, a fruit with the rudiments of the flower shrivelled up; 9, a fruit exhibiting yet the tube of the flower very distinctly; 10–11, seed of the larger, and 12, seed of the smaller form; 11, *g*, young seedling soon after germination.

Pl. 45. Cereus longisetus.

Pl. 46. Cereus stramineus: One head out of a plant with numerous heads.

Pl. 47. *The same:* Another head with smaller spines, seen from above; 2–4 bunches of spines; 5, fruit; 6, seed of the same, usual size; 7, seed of another specimen larger than usual.

Pl. 48. Fig. 1. A flower of the same.

Fig. 2–4. Cereus enneacanthus: 2, part of a stem showing the ribs and spines and a flower from El Paso; 3, flower of a specimen from Eagle Pass; 4, bunch of spines from El Paso; which, however, may belong to a form of C. stramineus; lower central spine triangular and much flattened.

Pl. 49. *The same:* 1, head of a specimen from Eagle Pass; 2, another one with longer and stouter spines; 3–10, bunches of spines of plants collected at Eagle Pass and at El Paso; 10, with a curved central spine; 11, fruit, belonging to flower, fig. 3, of last page; 12, seed of same.

Pl. 50. Cereus dubius: 1, part of a rib with a flower; 2, bunch of spines, and 3, seed of same plant; 4–5, bunches of spines of another specimen; 6, same, with flower just closed; 7, fruit, and 8, seed of same.

Pl. 51. Cereus Fendleri: A vigorous head of a plant brought from El Paso.

Pl. 52. *The same:* 1, top of a plant with flower-bud and flower from El Paso; 2, fruit with few and stouter spines; 3, seed of same; 4, fruit with numerous slender spines; 5, seed of same; 6, another form of seed.

Pl. 53. *The same:* 1, flower from Santa Fé; 2, young bunch of spines; 3–12, bunches of spines of different shape and size.

Pl. 54. Cereus polyacanthus in flower; usual form with short spines.

Pl. 55. *The same:* 1, part of a rib with a flower and a bud; 2–4, bunches of spines; 5, fruit with a bunch of spines; 6, seed of same; 7, fruit of another long-spined form; 8, seed of same.

Pl. 56. Cereus paucispinus: 1, an entire plant; 2, 5 bunches of spines; 6, seed.

Pl. 57. Cereus Engelmanni: 1, a head brought from Sonora by A. Schott; 2, young, and 3–4, older bunches of spines of the same; 5, fruit; 6, seed of same; 7, seed of Dr. Parry's original specimen.

Pl. 58. Cereus Berlandieri: 1, part of a plant with flower and flower-bud; 2–4, bunches of spines; 5, fruit; 6, seed.

Pl. 59. Fig. 1–11. Cereus procumbens: 1, a plant with flower-bud, flowers, and young fruit; 2–9, different bunches of spines; 10, fruit; 11, seed.

Fig. 12. Cereus tuberosus: seed.

Pl. 60. Fig. 1–4. Cereus Emoryi: 1, a fruit; 2, a bunch of spines of this fruit; 3, another one twice the natural size; 4, seed.

Fig. 5–6. Cereus variabilis: 5, fruit; 6, seed.

Pl. 61. Cereus giganteus: 1, part of the rib of an adult plant with two bunches of spines; 2, a bunch of spines; 3, part of a young rib of an adult plant collected in March; spines very short and slender yet; 4–5, bunches of spines of a young plant about eight inches high.

Pl. 62. *The same:* 1, flower; 2, fruit; 3, seed; *m*, side view of embryo, cotyledons a little open; *n*, front view of same.

Pl. 63. Cereus Greggii *a.* cismontanus: 1, a flower; 2, a young plant raised from seed in the third year, showing the tuberous root.

Pl. 64. *The same:* 1, lower part of a stem with the large tuberous root; half the natural size; 2–4, sections of the stem; 5–11, spines of different states of development and of different ages; all four times the natural size; 5, a bunch of very young spines imbedded in the wool of the areola; 6–10, full grown spines; 10, shows the lower spines crossed; 11, represents a very old bunch of spines; 12, a fruit; 13, seed.

Pl. 65. Cereus Greggii, *β.* transmontanus: 1, flower; 2–3, spines; four times magnified.

Pl. 66. Opuntia stenopetala: 1, part of a joint; 2, part of another one with two flowers; 3, section of flower.

Pl. 67. Opuntia Strigil: 1, an elongated joint with two fruits, bearing a young joint; 2, an orbicular joint; 3, several seeds.

Pl. 68. Opuntia filipendula: 1, a whole plant in flower, half natural size; 2, a joint with flower and young fruit, natural size; 3, seed of this plant from below El Paso; 4, seed of same from Doña Ana, above El Paso, a little smaller.

PL. 69. OPUNTIA MACRORHIZA: 1, a whole plant with flower and buds, half natural size; 2, fruit natural size; 3–4, seeds of different size.

PL. 70. OPUNTIA EMORYI, from the region southwest of El Paso, in fruit.

PL. 71. *The same:* 1, a whole plant, reduced; 2, lateral view of a tubercle with a bunch of spines; 3, front view of one of the largest bunches of spines; part of the central spine, four times magnified; 4, different seeds.

PL. 72. OPUNTIA GRAHAMI: 1, whole plant, with large tuberous roots, and in fruit; 2, a young joint; 3, a bunch of spines of the usual form; 4, another one with broader central spines; 5, seed. The seed, as well as parts of spines, are four times magnified.

PL. 73, FIG. 1–3. OPUNTIA SCHOTTII: 1–2, bunches of spines, with parts four times magnified; 3, seed with an oblique embryo.

FIG. 4. OPUNTIA SCHOTTII, var. GREGGII: a bunch of spines, with part magnified four times.

FIG. 5–6. OPUNTIA BULBISPINA: 5, an entire joint; 6, a bunch of spines, part of central spine four times magnified.

FIG. 7–8. OPUNTIA IMBRICATA: 7, a joint; 8, a bunch of spines, and fragment of central spine, four times the natural size, showing the sheath.

PL. 74. Seeds of—1, *Mamillaria calcarata;* 2, *Mamillaria compacta;* 3, *Mamillaria vivipara;* 4, *Mamillaria radiosa*, var. *borealis;* 5, *Mamillaria radiosa*, var. *Texana;* 6, *Mamillaria nuttallii a borealis;* 7, *β cæspitosa;* 8, *Mamillaria robusti spina;* 9, *Echinocactus uncinatus;* 10, *Echinocactus uncinatus*, var. *Wrightii;* 11–14, *Echinocactus sinuatus;* 11, from the San Pedro, Wright; 12, from northern Mexico, Gregg; 13, from the same regions, Poselger; 14, the form sent by Poselger under the name of *Echinocactus robustus;* 15, *Cereus Thurberi;* 16, *Cereus Schottii.*

PL. 75. Seeds of *Opuntia:* 1–4, *Opuntia Engelmanni;* 1, from Chihauhua, Wislizenus; 2, from Matamoras; 3, from Presidio, Bigelow; 4, from Santa Rosa, Bigelow; 5–7, *Opuntia dulcis*, Wright and Bigelow; 8, *Opuntia macrocentra*, Wright; 9–13, *Opuntia phæacantha;* 9, from Santa Fé, Fendler; 10–13, Southern New Mexico, Wright; 14, *Opuntia tenuispina*, El Paso; 15, *Opuntia arenaria*, El Paso; 16–17, *Opuntia arborescens;* 18, *Opuntia fulgida;* 19, *Opuntia mamillata.*

The maps accompanying this memoir represents the geographical distribution of the different species of *cactaceæ* in the United States and adjacent regions, as far as at present known.

DEPARTMENT OF THE INTERIOR,

Pacific Wagon Road Office, November 26, 1858.

The foregoing paper on the CACTACEÆ of the Boundary having been printed about two years ago, before the author's visit to Europe, it is deemed advisable, in justice to Dr. Engelmann, to append the following corrections made by him since his return.

ALBERT H. CAMPBELL,

In charge of Mexican Boundary Report.

CACTACEÆ OF THE BOUNDARY.

CORRECTIONS.

CACTACEAE OF THE BOUNDARY.

CORRECTIONS.

A voyage to Europe, since my paper has gone through the press, has afforded me the advantage not only of the personal intercourse with numerous men of science and many cultivators, but also of an actual examination of various large collections of living *cactaceae*. Some of the results of my investigations, as far as they bear upon the *Cactaceae of the Boundary*, have been incorporated with the list of corrections of typographical errors.

Page 2, line 22. *Sepalis petalisque.* It will scarcely be necessary to inform the reader that the numerous foliaceous integuments of the cactus-flower do not very properly range under the divisions of *sepals* and *petals*. For convenience sake, however, the exterior more herbaceous ones are called *sepals*, and the interior ones, with thinner texture and brighter color, are named *petals*. The "*sepals*" usually are more numerous than the "*petals*," and, in most genera, form a complete transition from the organs, which on the stem, represent the leaves, (usually with their spiny appendages) to the petals. On the ovary they usually resemble the former, which, among other reasons, seems to give color to the suggestion of Zuccarini mentioned in the note to page 39, line 29.

Page 2, note, line 10, omit *or*.

Page 2, note, line 15: after *found* omit ,.

Page 4, line 12: I follow De Candolle in giving, as one of the characters of the species, the number of the more distinct spirals of the tubercles in *Mamillariae* and cylindric *Opuntiae*, just as we describe the number of ribs of *Echinocacti* or *Cerei*. It is now well known that no character can be deduced from the direction of the spirals to the right or left. It is also known that the greater or less prominence of one or the other spiral depends on the number and crowded state of the tubercles and the comparative thickness and elongation of the axis. The characters deduced therefrom are not absolute, nor are they quite scientific. It would be more exact to state the phyllotactic law of the arrangement of the tubercles. I would have to say that *M. micromeris* has its tubercles arranged after the $\frac{13}{34}$ or even the $\frac{21}{55}$ system. But I suppose the plan followed by me is more intelligible to most readers, and not much less clear to the scientific phyllotaxist.

Page 5, line 4. *M. microthele* is well distinguished from our species by its much larger tubercles and two unusually stout and short central spines.

Page 5, line 36. The pale yellow spines look like the fibres of raw silk, and form a silk-like tuft, but are not *tipped by a brush*.

Page 6, line 25, for *pluribusve*, read *alterove*.

Page 6, line 29, after *hilum* omit —.

Page 7, line 7, for *umbillicus*, read *umbilicus*.

Page 7, line 15, after *dilatatis* put ;.

Page 7, line 28, for *tuberculata*, read *tuberculosa*. *M. Grahami* is nearly allied to *M. Schelhasii*, Pfr., from Real del Monte, Mexico. The next species, *M. Wrightii*, is closely allied to *M. zephyranthoides*, Scheidw., from Oaxaca, Mexico; without the flower, however, and especially without the fruit and seed, which latter has never been paid attention to. These plants can scarcely be sufficiently well characterized, nor their relationship ascertained.

Page 8, line 19, for GOODRICHII, read GOODRIDGII.

Page 9, line 28, for *interior*, read *exterior*. *M. sphaerica* is almost too closely allied to the Mexican *M. longimamma*, DC.

Page 10, line 41. The plant here described as a variety exactly agrees with some original specimens of *M. Scheerii* preserved in the collection of Prince Salm-Dyck. It will not be useless here to urge the importance of preserving the dead cactus plants, or, as these specimens are fancifully called, the "*skeletons*." I have been materially assisted by being able to examine the skeletons of some authentic original specimens, of which no living ones are now found in the gardens. But generally the dead plants are thrown aside, and a description, often vague or incomplete, or at best an indifferent figure, is all that is left for future identification. Unscrupulous gardeners and traders do their best to increase the confusion.

Page 11, line 7, for *mucranatis*, read *mucronatis*.

Page 12, line 9, for *last*, read *next*. *M. pectinata* is probably not sufficiently distinct from *M. radians*, DC., and with it, and both the following species, *M. Echinus* and *M. scolymoides*, may belong to *M. cornifera*, DC., the two former being the forms without, and the three latter those with, central spines.

Page 14. *M. scolymoides*. A specimen brought by *Dr. Bigelow* has flowered. The flower greatly resembles that of *M. pectinata*, figured on plate 11, but is more of a reddish than yellow tinge. *Dr. Poselger* assures me that they also vary with white or whitish flowers. *M. tuberculosa* is clearly identical with *M. strobiliformis*, Scheer in Salm, Hort. Dyck, (1850,) as I have ascertained by a careful examination of the original specimen (now dead) in the collection of Prince Salm. Mr. Scheer's name, having the priority, must be substituted for mine.

Page 14, line 26, for *X., fig.* 1–6, read *XXII., fig.* 1–16.

Page 15, line 9, for 18, read 22.

Page 15, line 15, for *interior*, read *exterior*.

Page 16, line 5, for *tulis*, read *patulis*.

Page 17, line 9, for *spine*, read *spines*. *M. heteromorpha*, Scheer in Hort. Dyck, 1850, is the same species, to judge from the "skeleton" of the original specimen in Coll. Salm. *Anhalonium*. As the genera of *Cactaceae* are now constituted, *Anhalonium* will probably better be kept distinct from *Mamillaria*. A second section of the genus, with flattened tubercles arranged into ribs, would comprise *Echinocactus Williamsii*, Lem. The tufts of dense wool on this plant do not represent the (absent) spines, but are axillary productions, surrounding and partly including the flower and fruit. The ovary is perfectly naked, as in other *Anhalonia* or *Mamillariae*, which has already been noticed by others. The interesting *Leuchtenbergia Principis*, Fisch., may possibly have to be reduced to a third section of this genus. The flowers being borne just below the tip of the nascent tubercles, (which, when full grown, are three to six or

seven inches long, prismatic or awl-shaped, and bear at the tip several flat flexible scales in place of spines,) the plant can have no affinity with *Cereus*. If the ovary should prove to be naked, the large flower and elongated tube would not be sufficient to separate it from *Anhalonium* Mr. Labouret, in his *Monographie des Cactées*, Paris, (without date, probably 1853,) page 162, notices the position of the flower. I have seen the young buds below the apex of the tubercle at Kew, and the scar left by the fallen fruit at Mr. Haage's in Erfurt, but could not meet with either flower or fruit itself. *A. fissuratum* is very nearly allied to the Mexican *A. sulcatum*, Salm, (*A. Kotchubei*, Lem.,) of which it seems no living nor dead specimen is at present extant in Europe. The upper surface of the tubercle of *A. sulcatum* is said to be deeply grooved, the groove being filled with silky tomentum; otherwise the tubercles are said to be smooth.

Page 17, line 36, for *applanta*, read *applanata*.

Page 20, line 24, for *superioribus*, read *mediis*.

Page 20, line 29, before *hilo* put ;.

Page 21, line 21, after *San Pedro* put (*Tab. XX.*) Fig. 12 exhibits the enlarged *funiculi*, which consist of a loose juicy tissue. It seems that in most *Cactaceae* the *funiculi* towards maturity become large and juicy; usually their cells then burst, and form the so-called pulp, in which the seeds are described as nestling: "*semina nidulantia.*"

Page 21, line 24, for *albo*, read *albo—*.

Page 22, line 12, after *junioribus* insert *plerisque purpureis, adultis.*

Page 22, line 19, for *interioribus* read *superioribus.*

Page 22, line 24, after *crassispinus:* insert *aculeis robustissimis, radialibus* 8–11, *centralibus*, 4 *angulatis, infimo flexuoso plus minus hamato.*

Page 22, line 42, after *spines*, put *in var.* γ

Page 23, line 1, for *often*, read *when young.*

Page 23, line 14, after *annulated*, put , in place of ;. It ought to have been mentioned that the lower central spine is as long as the others or more commonly greatly exceeds them.

Page 23, line 41, put the (before *interdum* instead of before *aculeo.*

Page 24, line 22, for *ex* (*Parry*) read *ex Parry*).

Page 24, line 23, for *mimus*, read *minus.*

Page 25, last line, after *addita*, omit ,.

Page 26, line 1, for *angulatis*, read *annulatis.*

Page 26, line 11, after *distinct*, put ;.

Page 26, line 13, after *divergent;* omit ;.

Page 26, line 14, after *stoutest* put ,. *E. horizonthalonius;* numerous original specimens of this plant, living and dead, examined in European collections, leave no doubt of the entire identity of the different forms, which can scarcely be counted as varieties.

Page 28, line 1, after *intertextis* put ,.

Page 30, line 25, for *fig.* 1, read *fig.* 1–2.

Page 31, line 13, after *acutis* put ,.

Page 32, line 4, for *incisota*, read *inciso.*

Page 32, line 9, for ; before 12, put ,.

Page 32, line 42, for *XXXIII–XXXIV*, read *XLIII–XLIV.*

Page 32, last line, after *patulis* put ,.

Page 33, line 14, for *centralibus*, read *setaceis*.

Page 34, line 6, after *curvato*. add (*Tab. LI–LIII.*)

Page 35, line 39, for *those*, read *these*.

Page 37, line 7, for *to tubercles*, read *its tubercles*.

Page 37, line 26, for 6 *lines;* read 6 *lines*,.

Page 38, line 18, after *cultivation*, put *in St. Louis, Cincinnati, etc.*

Page 38, line 31, *C. pentalophus* is *erect* "10–15 inches high" only when so trained. It grows naturally like *C. Berlandieri, C. procumbens* and *C. Ehrenbergii*, Pfeif., all of which closely resemble one another in habit. *C. Pentalophus* has a 5-angled stem of bright green color with short spines; *C. Ehrenbergii* is usually 6-angled, pale green, with numerous long and setaceous spines; flower and fruit of either seem to be unknown.

Page 38, line 42, *LXIX*, read *LIX*.

Page 39, line 17, *LXIX*, read *LIX*.

Page 39, line 21. The root of young plants forms a single globose tuber, in older ones it consists of a cluster of several oval or cylindric tubers, sometimes 6 or 8 in number, 1–1½ inch in diameter, and 2–3 inches long.

Page 39, line 29, after *family*, add : or the specimen observed by Dr. Poselger offered one of those rare anomalies (one of which, found by Zuccarini in *Cereus serpentinus*, was figured by him in the Annals of the Munich Academy) where the ovary actually forms the continuation and termination of a branch, by which the sagacious observer just mentioned was induced to consider the so-called ovary of *Cactaceae* itself a branch, with the real ovary immersed in it. But how would he view it in *Mamillaria?*

Page 40, line 18, after *fruit*, omit *flower*.

Page 40, line 31, before *smooth*, insert *nearly*.

Page 40, line 31, before *linear*, put *or*.

Page 41, line 13. This is *C. Pottsii*, Salm, Hort. Dyck, a later name.

Page 42, line 14, after *brevioribus* put ,.

Page 42, line 16, for *albido*, read *alb.do*—.

Page 46, line 10, for *ovari*, read *ovarii*.

Page 46, line 26. Cultivated specimens of *O. grandis* are erect, because, tied to the stake, they are not permitted to grow otherwise. Their white spines seem to grow dark very soon, and the smaller number and greater distance of the spines may be owing to the influence of cultivation. There is, therefore, scarcely a permanent character left to distinguish the new species from this one.

Page 47, line 6, after *succosa*, omit ,.

Page 47, line 8. This *margin* is the enlarged and indurated *funiculus* itself, which, by a lateral expansion, envelopes the seed proper and forms its exterior bony coating. This dilatation of the *funiculus* takes place long before the flowering period; it covers the *ovulum* so completely that only two small lateral openings remain, which lead to the *orifice*. After Mr. Payen and others had already noticed this expansion of the *funiculus*, Dr. Caspary, of Bonn, lately has more completely investigated its nature. It appears that in many, if not in all other *Cactaceae* the funiculus is bent over the orifice of the *ovulum*, partly covering it; (I have seen it in some *Mamillariae, Echinocacti*, and *Cerei;*) but that only in *Opuntiae* it expands into an exterior

seminal coat, which is distinguished from *arillus* proper only by its being already fully formed at the flowering period.

Page 49, line 16, for *Tuna*, read *Ficus Indica*.

Page 49, line 24, for *flaro*, read *flavo*.

Page 51, line 42, after 20–30 put ,.

Page 52, line 29, after *ovata;* omit ; and read: *aculeolis inaequalibus armata ; umbilico infundibuliformi ; seminibus*, etc.

Page 53, line 37, put *setosissimis* before *stipata*.

Page 54, line 16, for *pulvillis*, read *pulvilli*.

Page 54, line 17, after *Seeds*, insert *very different in size and shape*.

Page 54, line 18, after *fruit* put ,.

Page 54, line 34, for *ovata*, read *obovato—*.

Page 54, line 34, after *clavata* put ,.

Page 55, line 8, for *folii*, read *foliis*.

Page 56, line 13, for *first*, read *fruit*.

Page 57, line 14, omit *numerosis*.

Page 58, line 14, for 1012, read 10–12. *O. arborescens* seems to be very closely allied, if not identical, with *O. rosea*, DC., and *O. imbricata*, DC. The former is described from a figure; the flower and fruit of the latter remain unknown, so that it is difficult, if not impossible at present, to solve these doubts.

Page 59, line 4, for *Bubuquibari*, read *Babuquibari*.

Page 59, line 30. *O. Wrightii* may not be different from *O. Kleiniae*, DC., from Mexico, long cultivated in Europe, the flower of which does not seem to be known.

Page 60, line 21. *O. frutescens* seems identical with *O. gracilis*, Hort. Monac, and *O. virgata*, Hort. Vind., the flower and fruit of which are unknown. It is stated that the spines of *O. gracilis* are not vaginate. This is no doubt a mistake; but the sheath is probably not as loose as in others. It corresponds, therefore, with my var. *brevispina*, Synops. Cact. in Proc. Am. Ac. A. Sc., vol. III. In delicate specimens, and such are usually the cultivated ones, the spines of most of the cylindric *Opuntiae* do not exhibit the sheath very plainly; it usually adheres closely to the body of the spine. This *vagina* consists, like the whole spine, of elongated indurated cells; the barbs of the spine are covered by it and are closely adpressed until the vagina detaches itself which commonly takes place very early.

Page 61, column 2 line 30, for 2, read 64.

Page 61, column 2, line 39, for *Goodrichii*, read *Goodridgii*.

Page 62, column 1, line 25, omit entirely.

Page 62, column 2, line 10, for 6, read 68.

Page 64, line 14, for *Goodrichii*, read *Goodridgii*.

Page 66, line 13, before 14, put 12 *and* 13, *bunches of spines of this variety;*.

Page 68, line 18, for *nutallis* read *Nuttallii*.

Page 68, line 24, for *Chihauhua*, read *Chihuahua*.

Page 68, the *map* (not *maps*) mentioned in the two last lines has been necessarily left out.

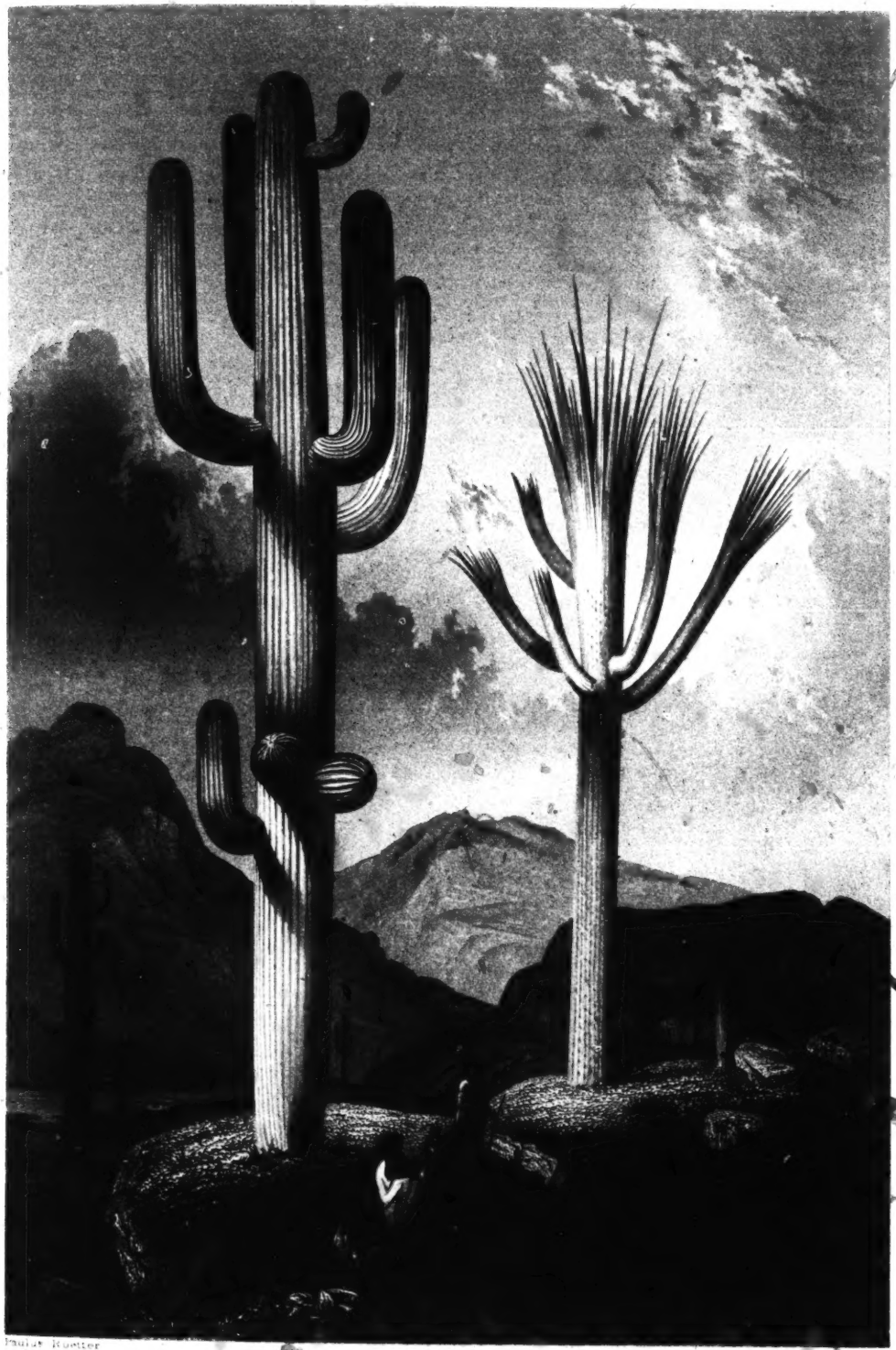
Mr. Paulus Roetter, of St. Louis, made the drawings for the plates under the close superintendence of the author. The steel engravings were done partly by Mr. W. H. Dougal, of Georgetown, D. C., a few by Messrs. Maillard & Connor, of St. Louis, and the balance by

European artists, viz: Mr. Weber, of Berlin, Prussia, and Mr. Davesne, Mr. Rebuffet, Mr. Martin Schmelz, and the brothers Picart, all of Paris, France. The high order of excellence of the engravings, especially of those of the Picarts and of Schmelz cannot fail to strike those who examine the plates.

In the figures of the embryos in plate 24, 34, 41 and 47, the line indicating the division of the cotyledons does not show in all the copies. The embryo in plate 24 and 34 resembles that of pl. 74, fig. 9 and 10; and that of plate 41 and 47, is like that on plate 55.

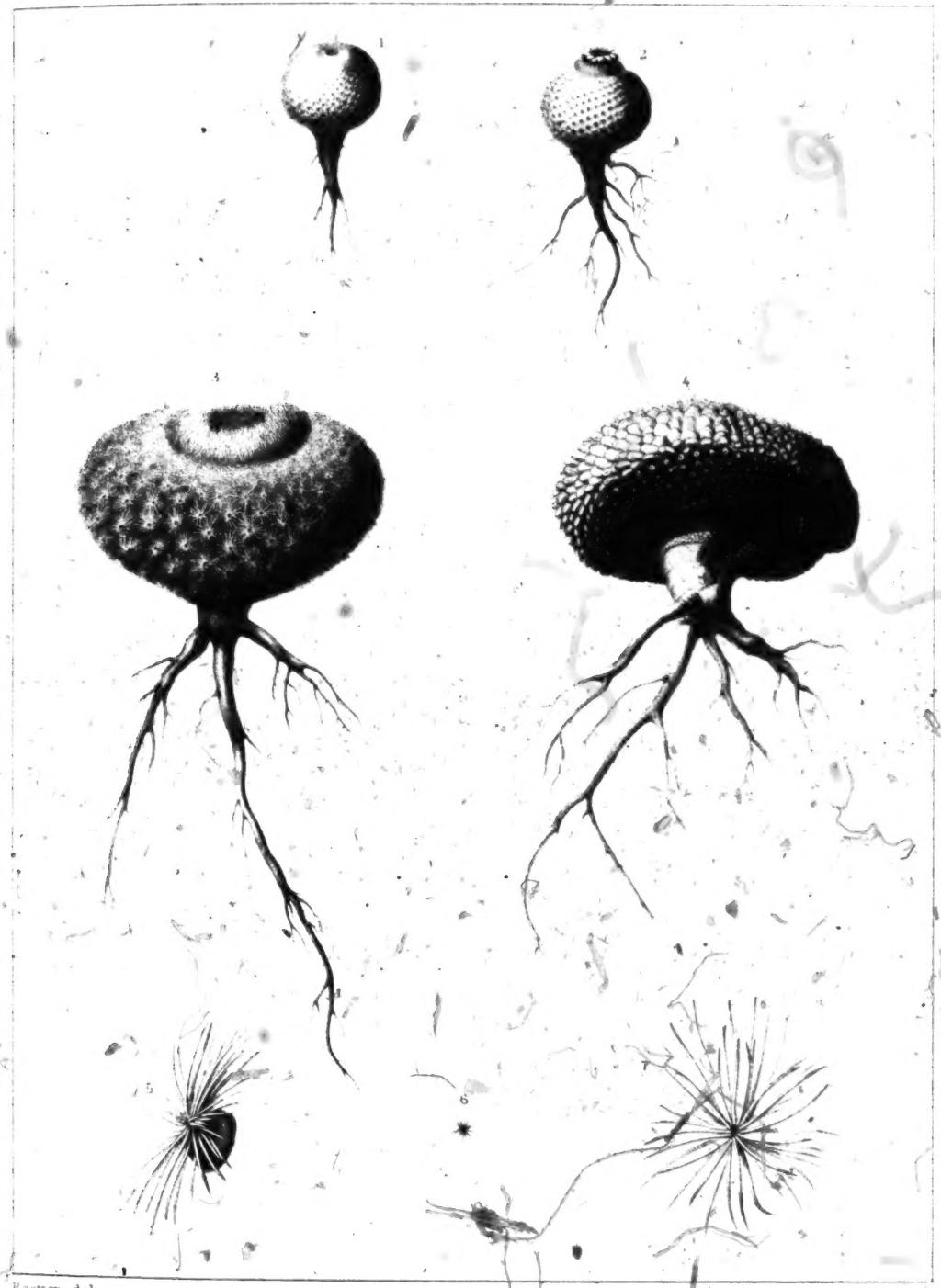
GEORGE ENGELMANN.

St. Louis, *November*, 1858.



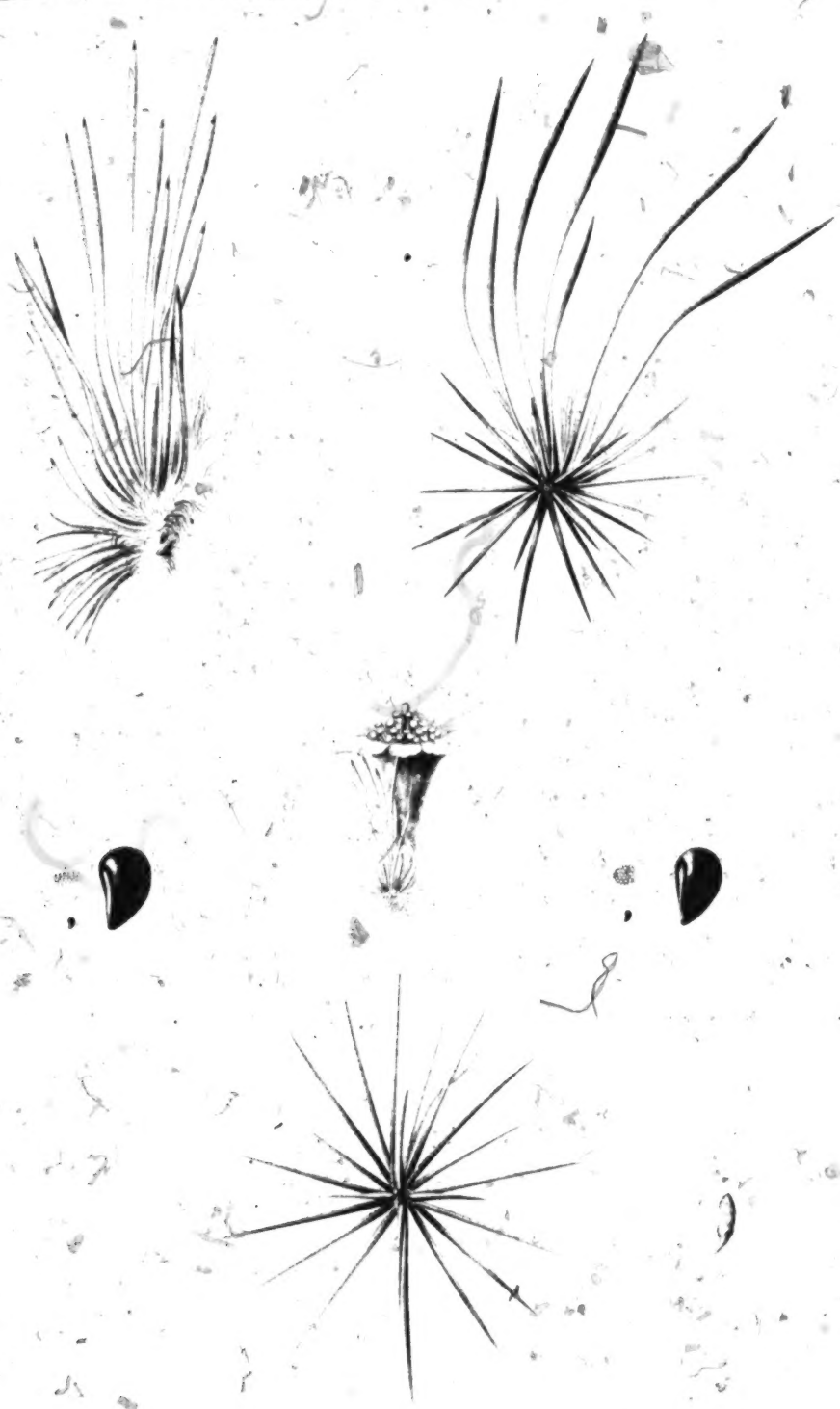
Paulus Ruetter

James D. Smillie



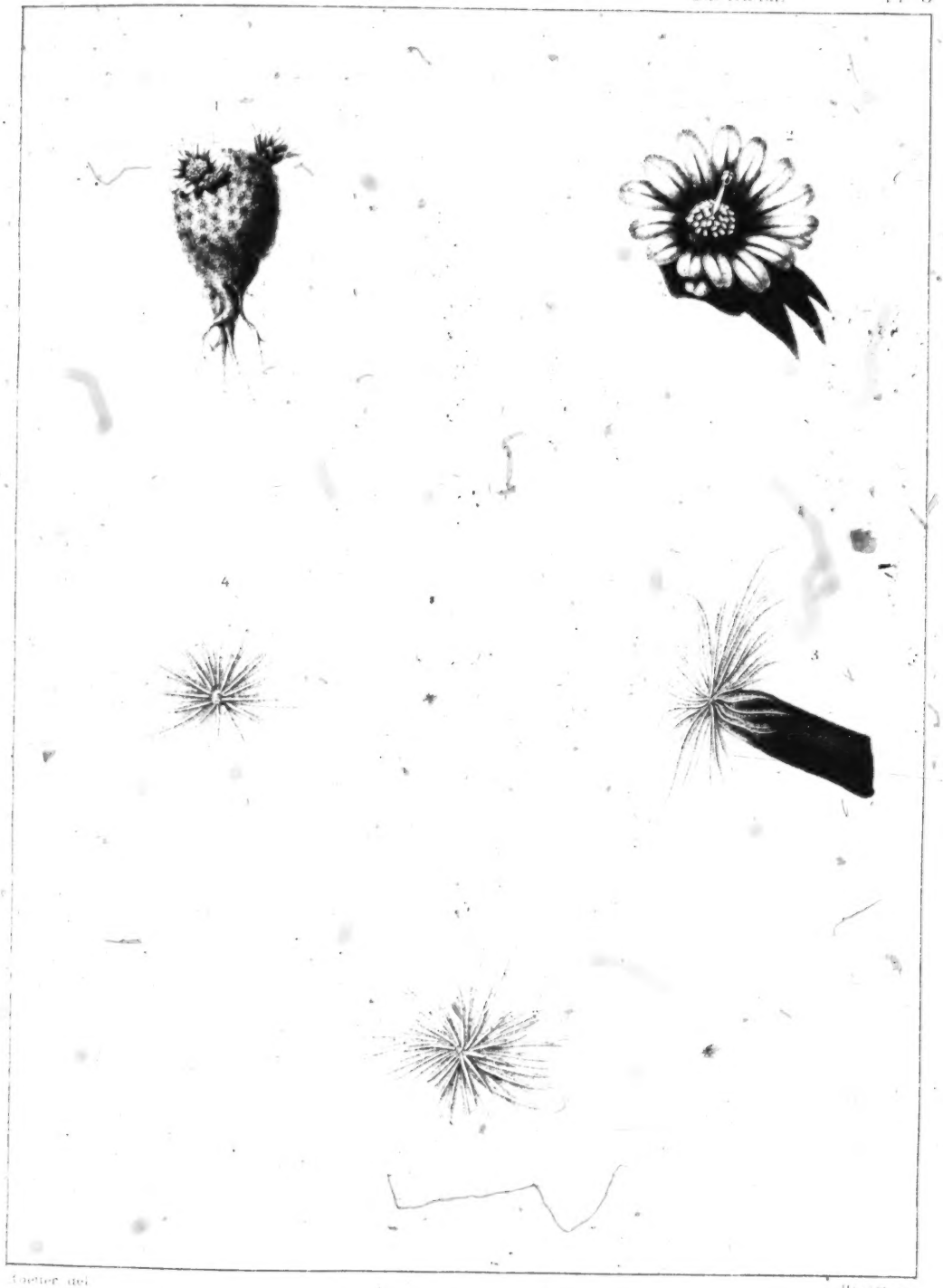
Roetter del. Picart sc.

MAMILLARIA MICROMERIS



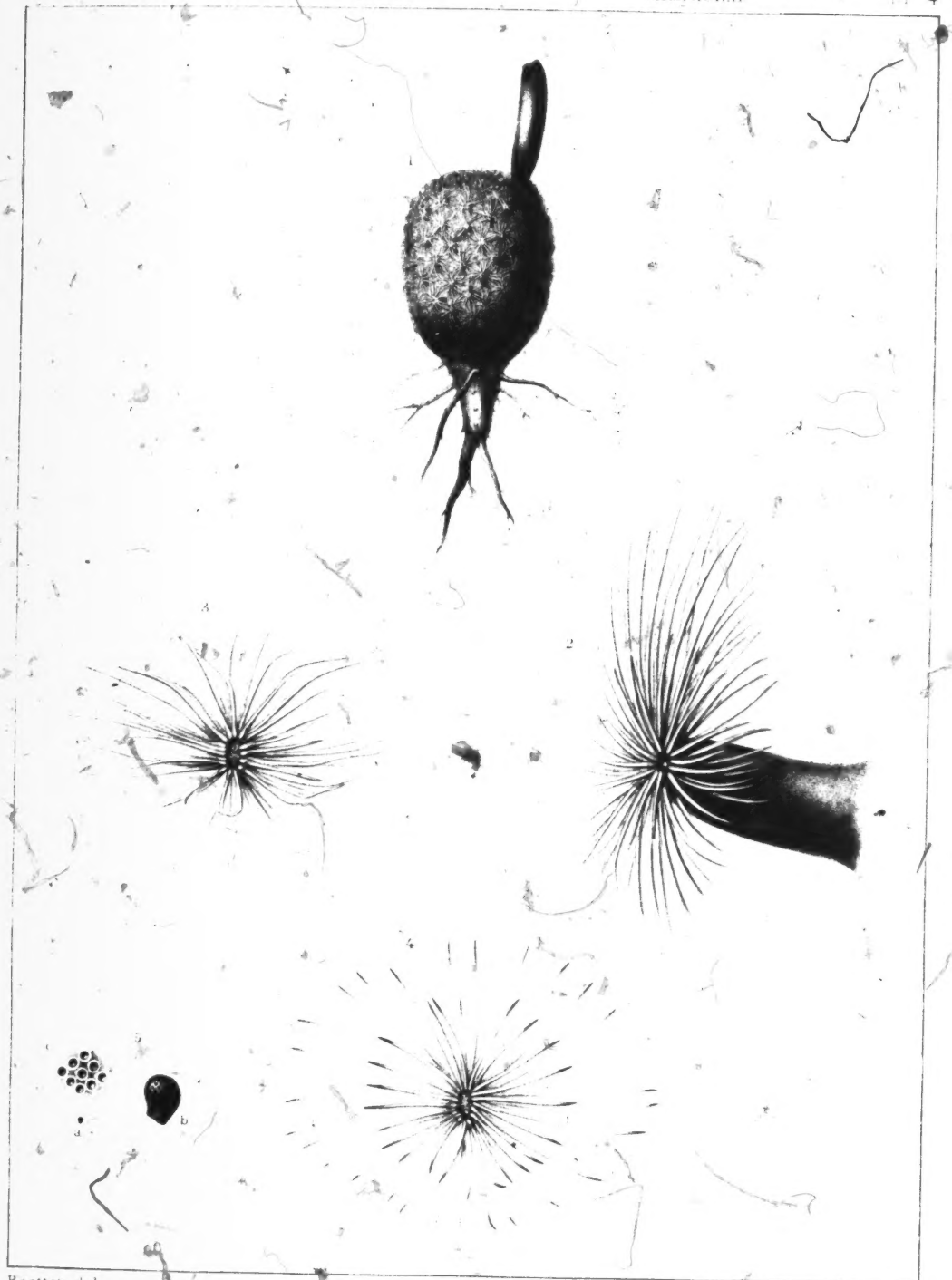
1-4 MAMILLARIA MICROMERIS

5-8 VAR. GREGGII



Sartier del. Picart sc

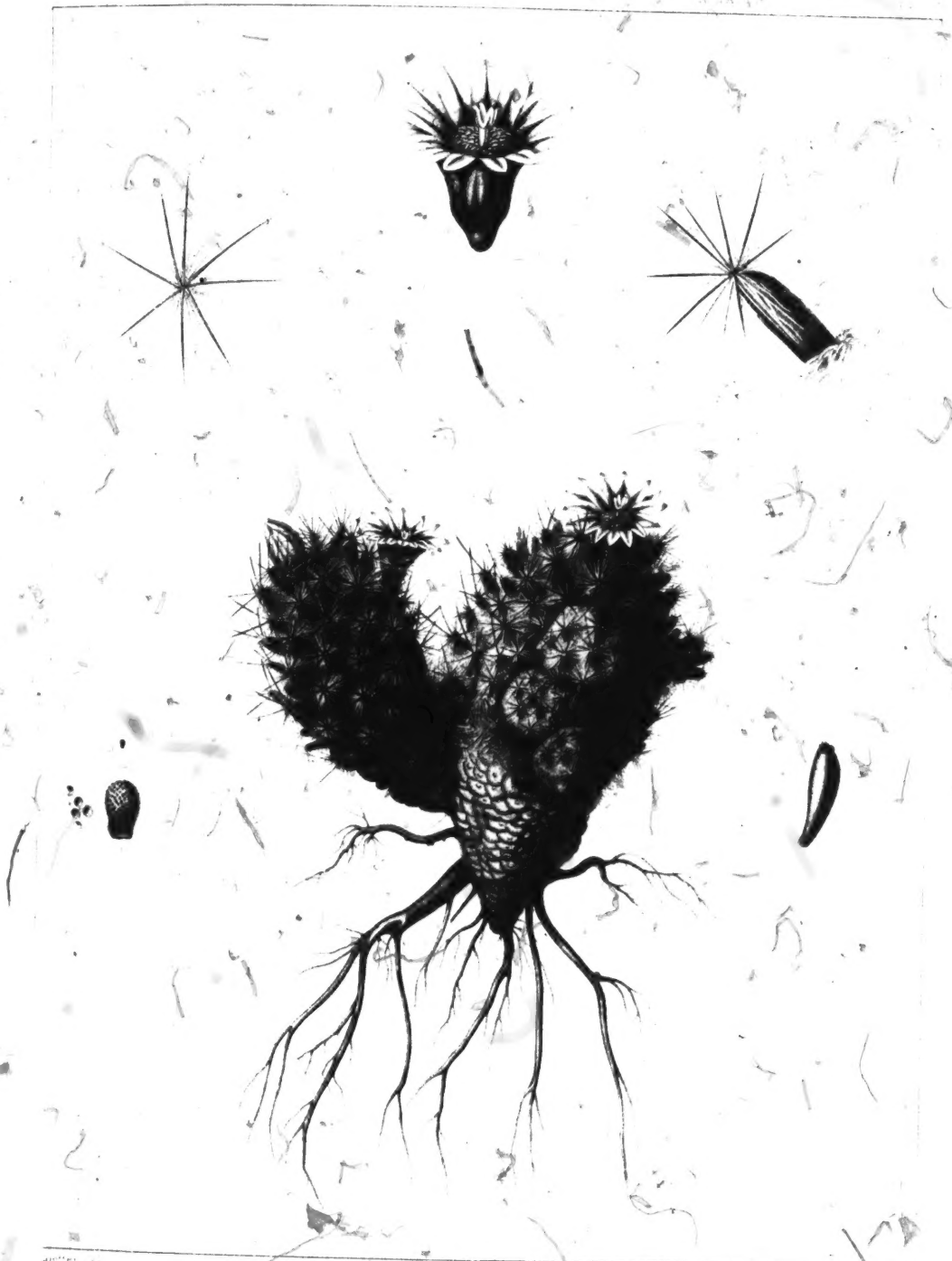
MAMILLARIA LASIACANTHA



Roetter del

MAMILLARIA LASIACANTHA, VAR. DENUDATA

Picart sc



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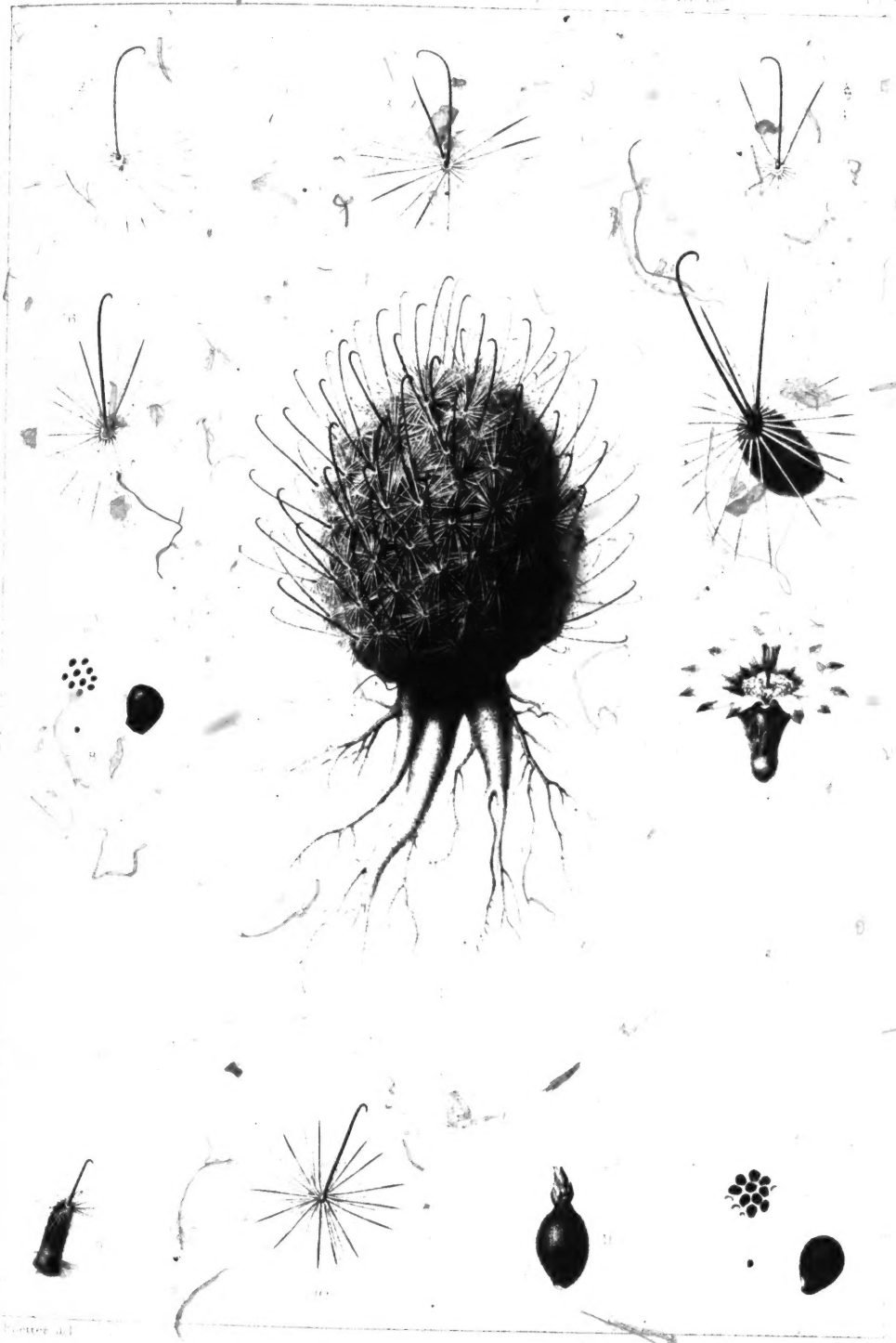
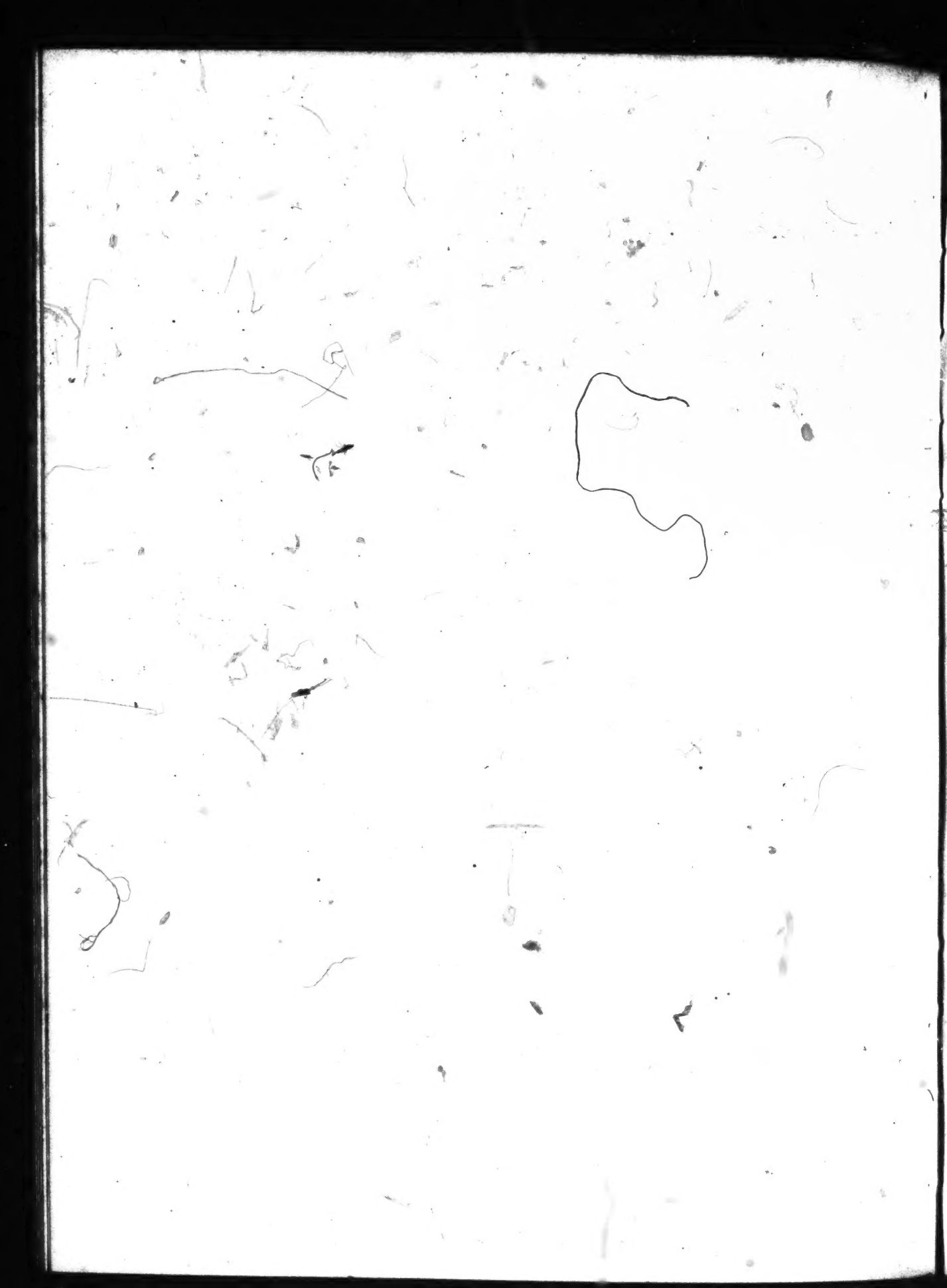


1-8 MAMILLARIA GRAHAMI

9-12 MAMILLARIA BARBATA



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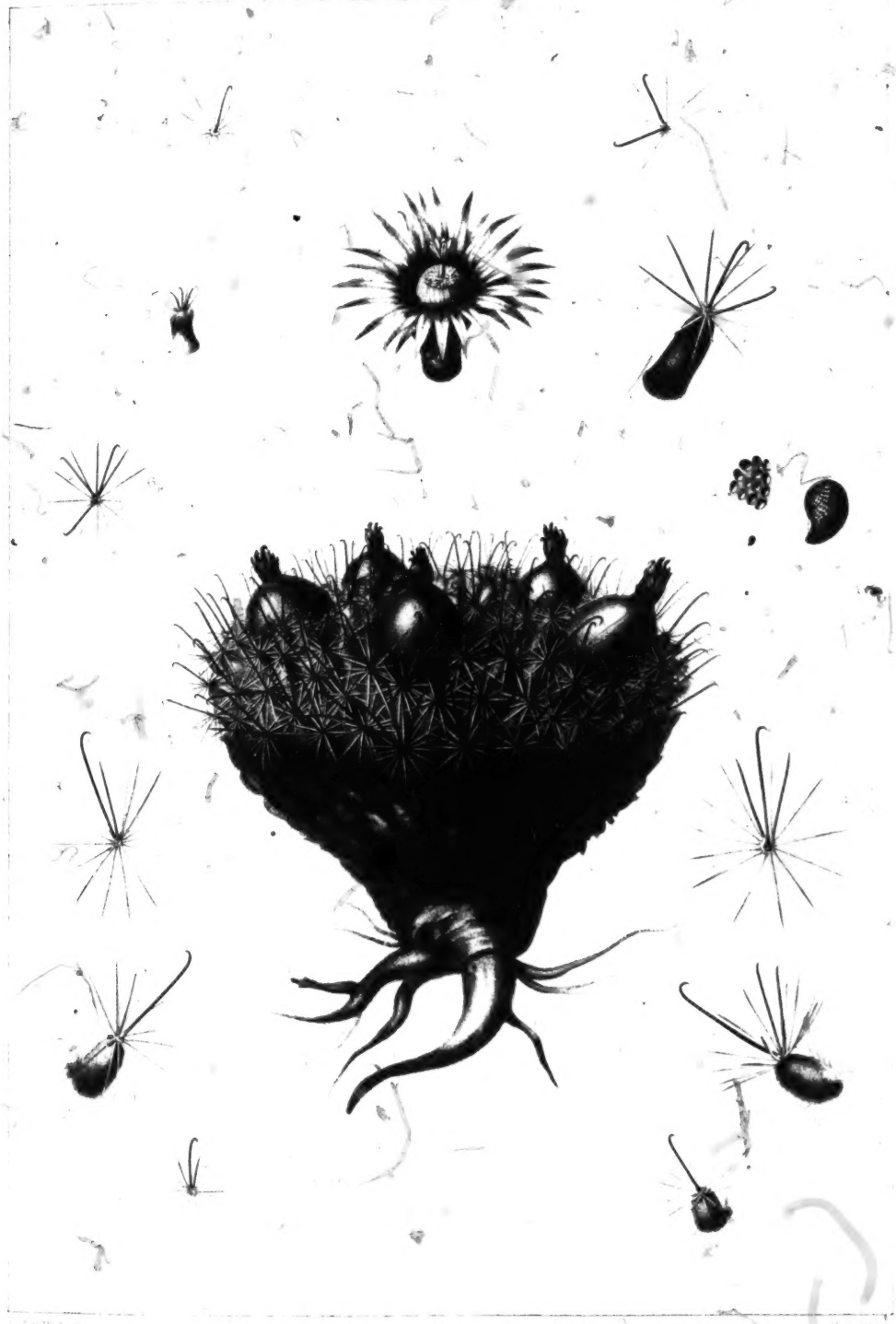

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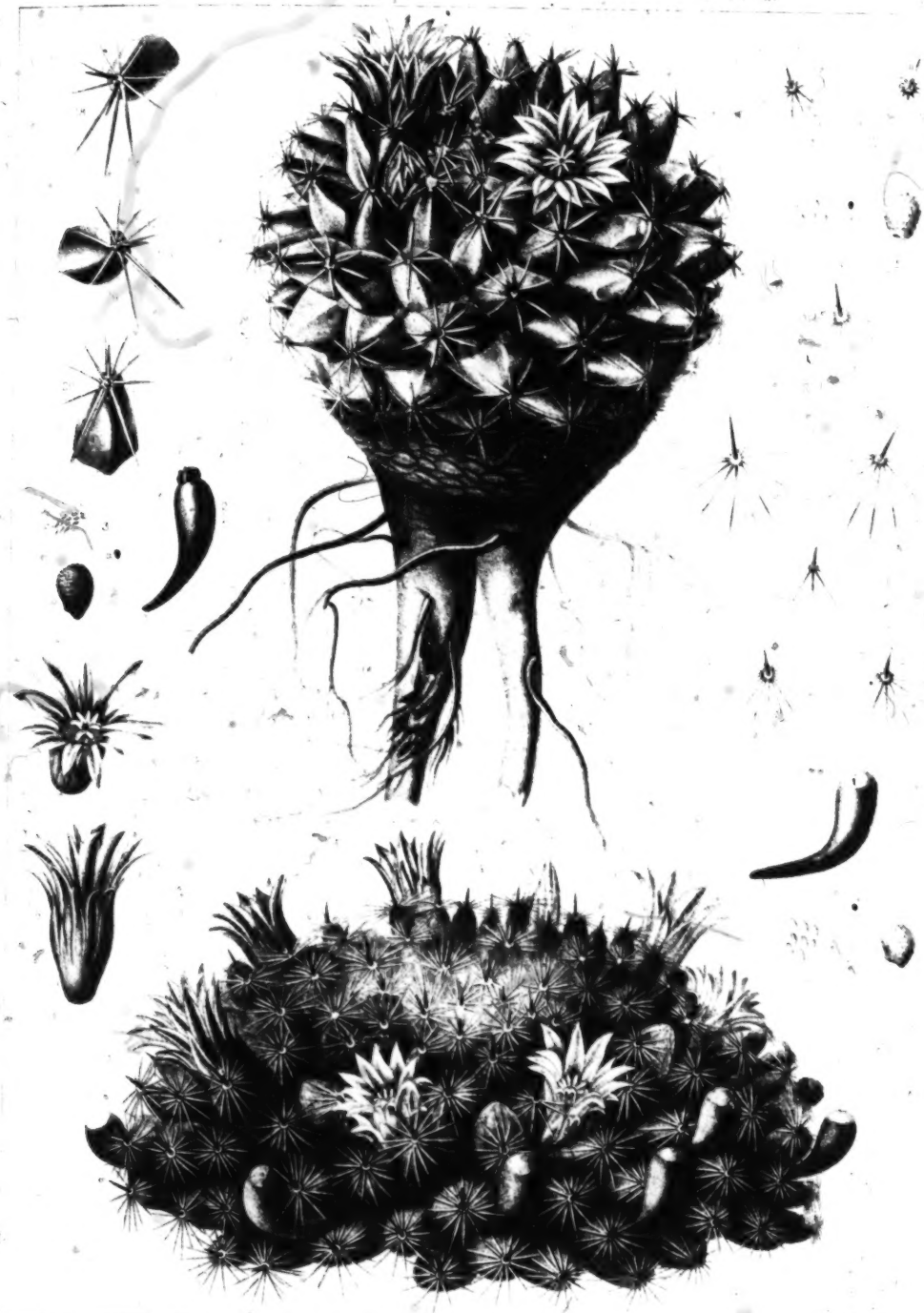
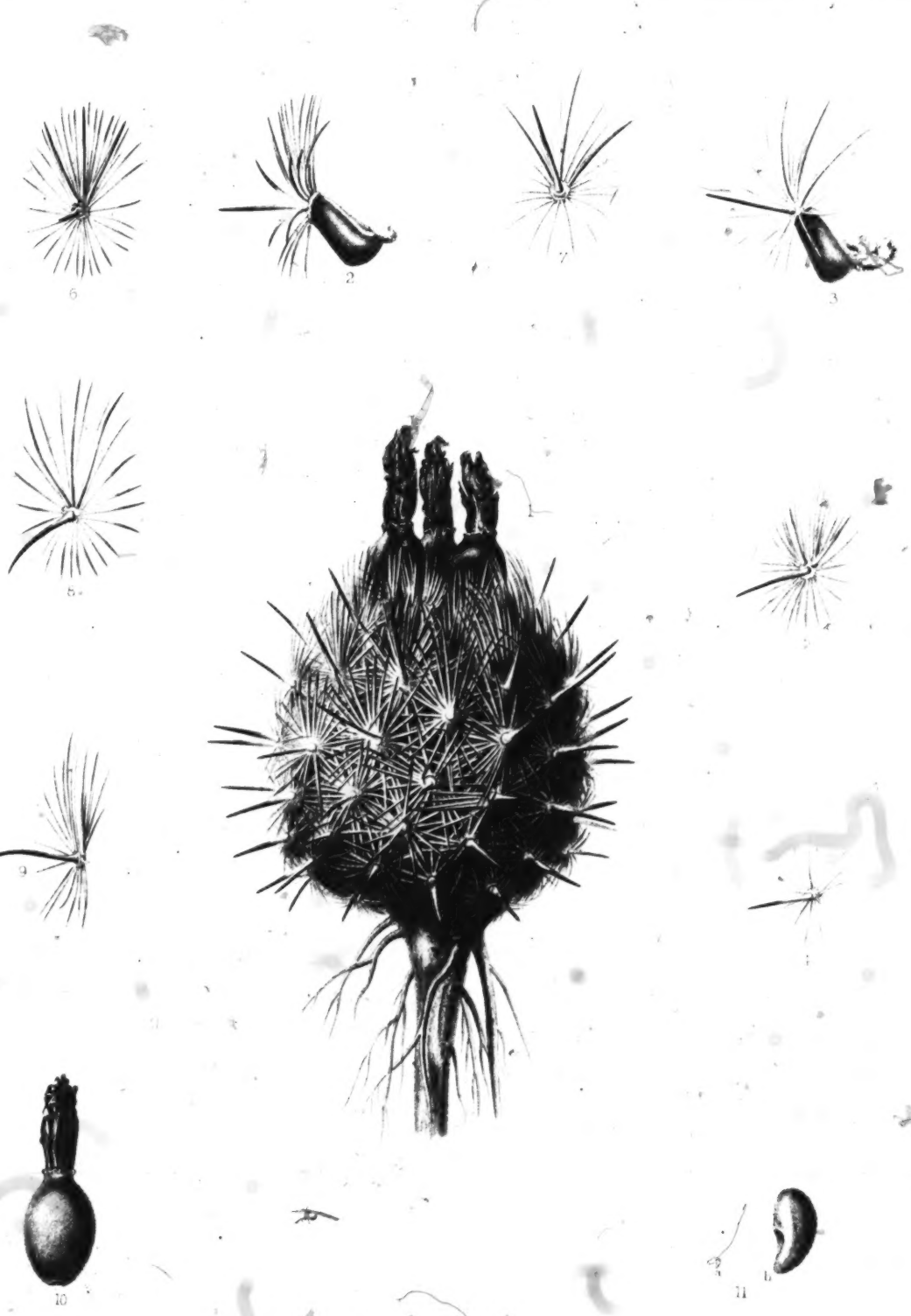
9-14 MAMILLARIA GOODRIDGII



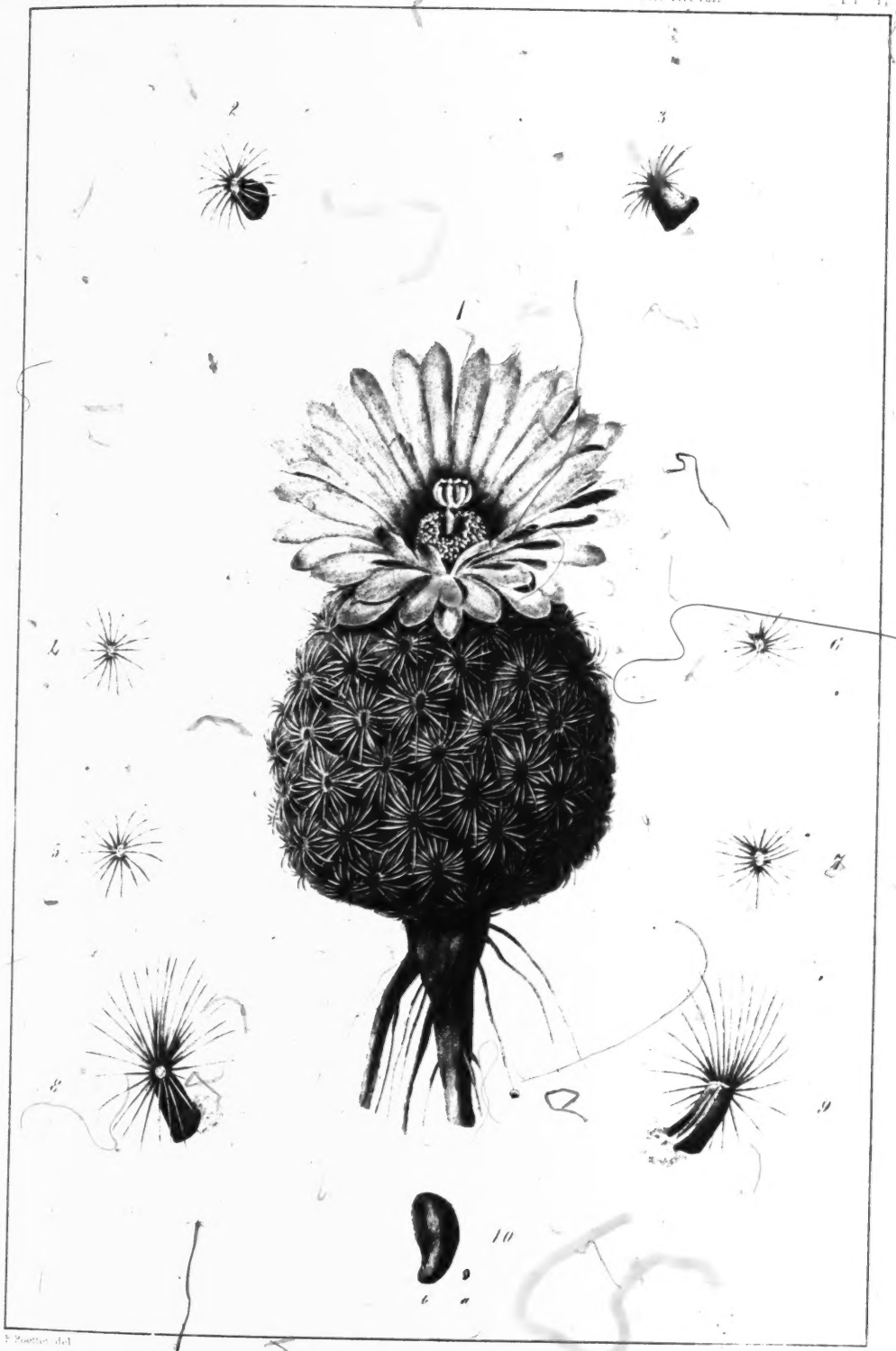
1-3 MAMILLARIA MEIACANTHA
15-17 VAR HEMISPHAERICA

4-14 M HEYDERI VAR APPLANATA
18-20 M GUMMIFERA



P. Roemer del.

MAMILLARIA ECHINUS

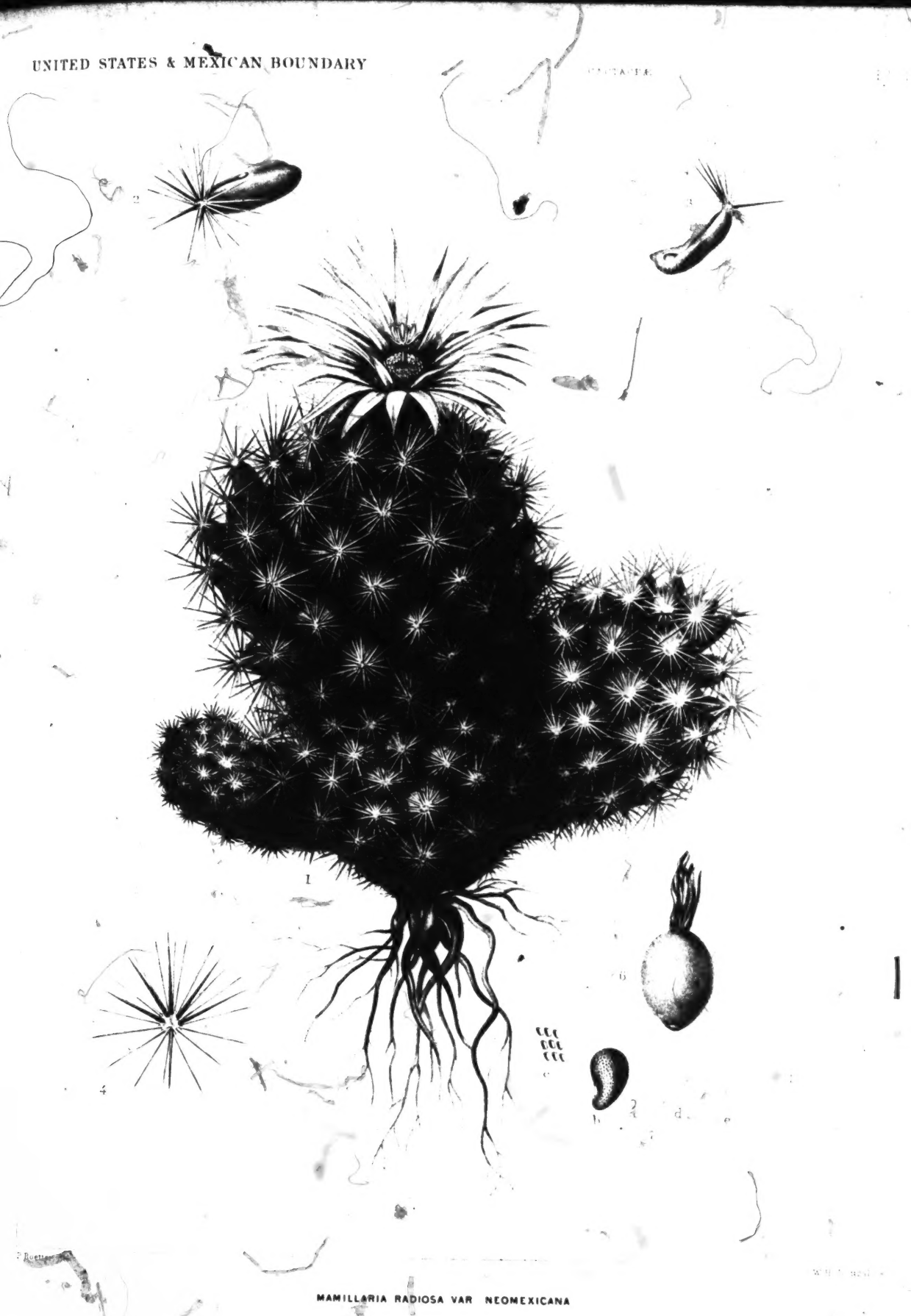


MAMILLARIA PECTINATA E

1-16 MAMILLARIA TUBERCULOSA

17-22 " DASYACANTHA

UNITED STATES & MEXICAN BOUNDARY



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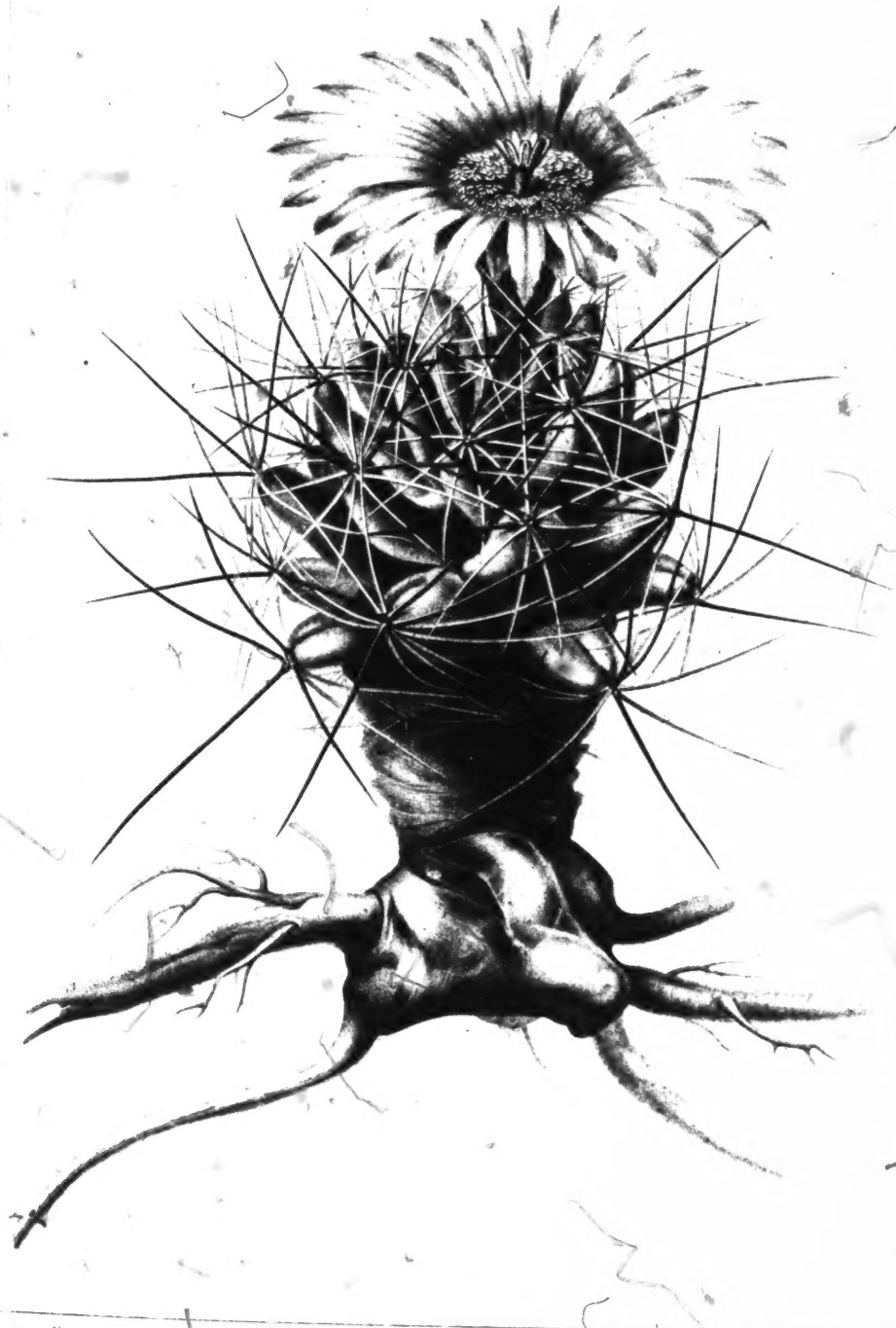

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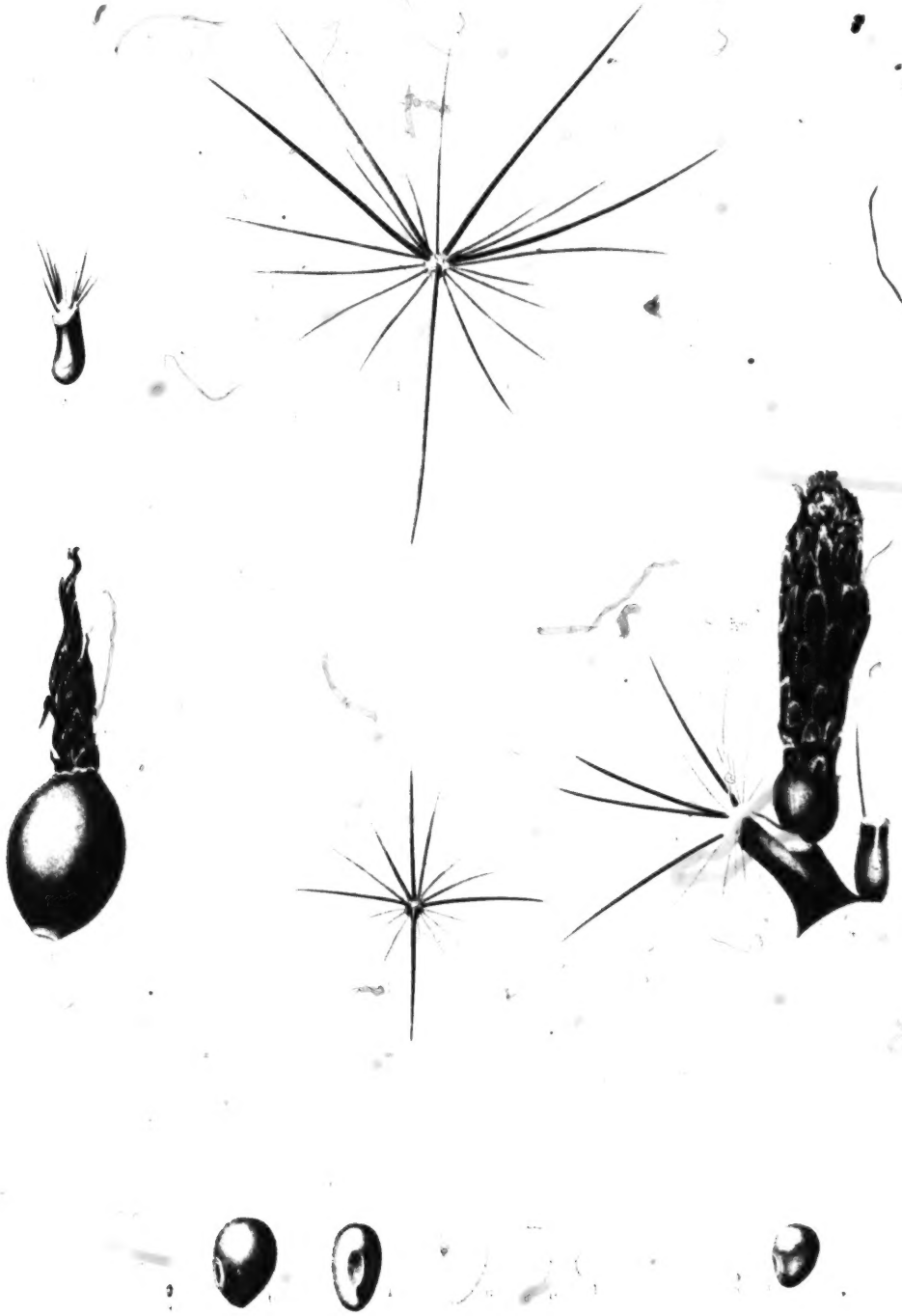

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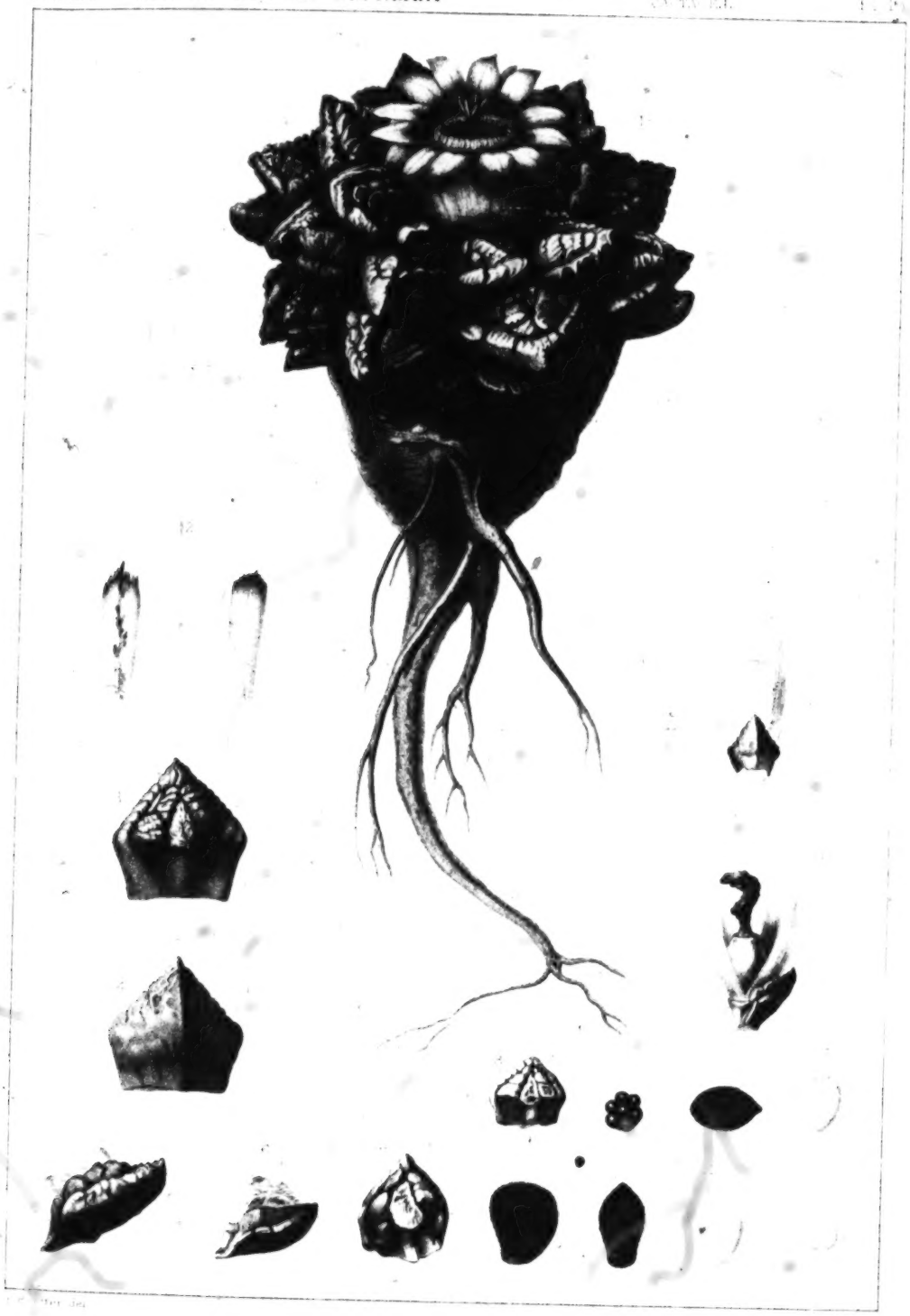


MAMILLARIA FISSURATA

ECHINOCACTUS SCHEERII

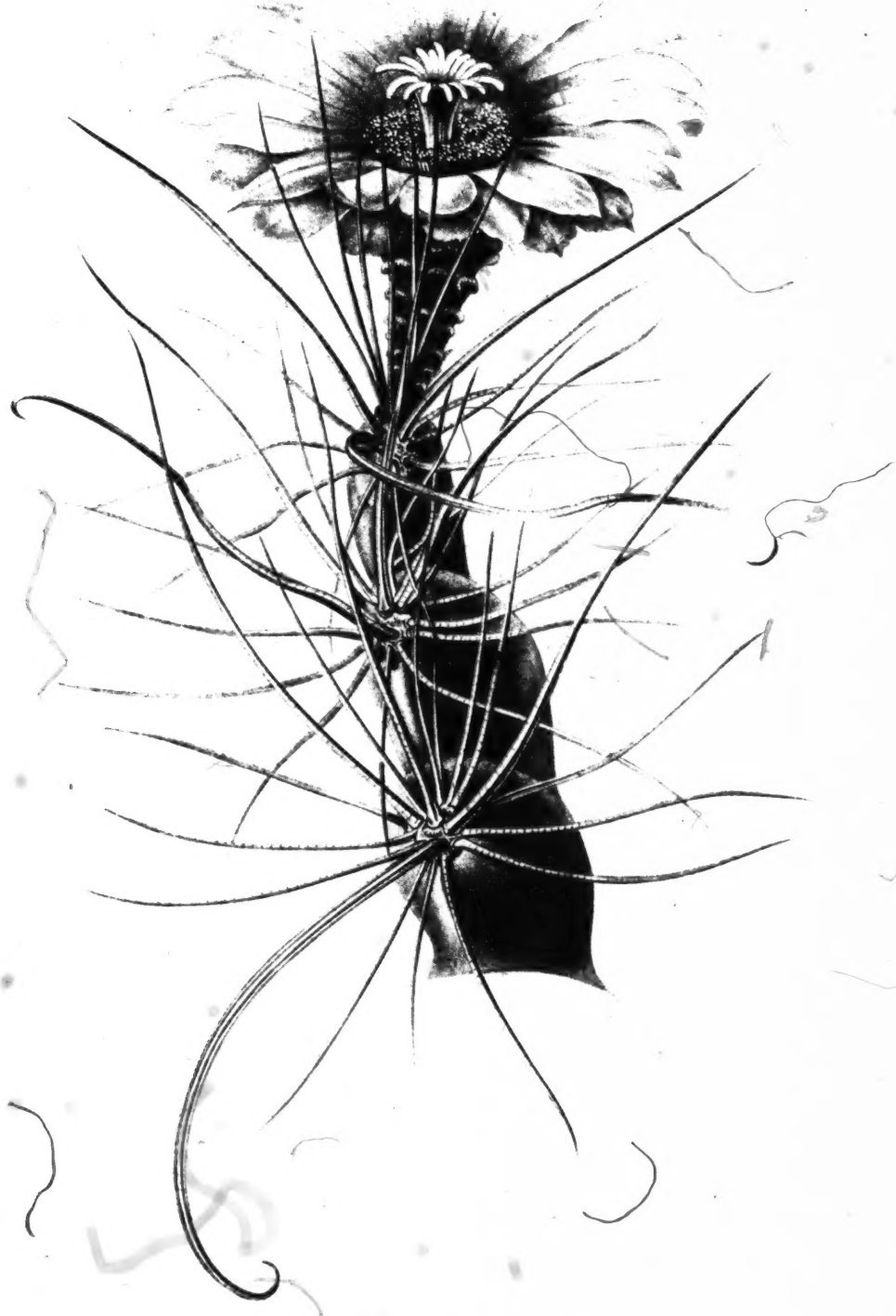
F Kreutter del

ECHINOCACTUS BREVIHAMATUS

ECHINOCACTUS BREVIHAMATUS

P. Rotter del.

ECHINOCACTUS SETISPINUS



P. Rattler del

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J. Roetter del.

Bongart sc.

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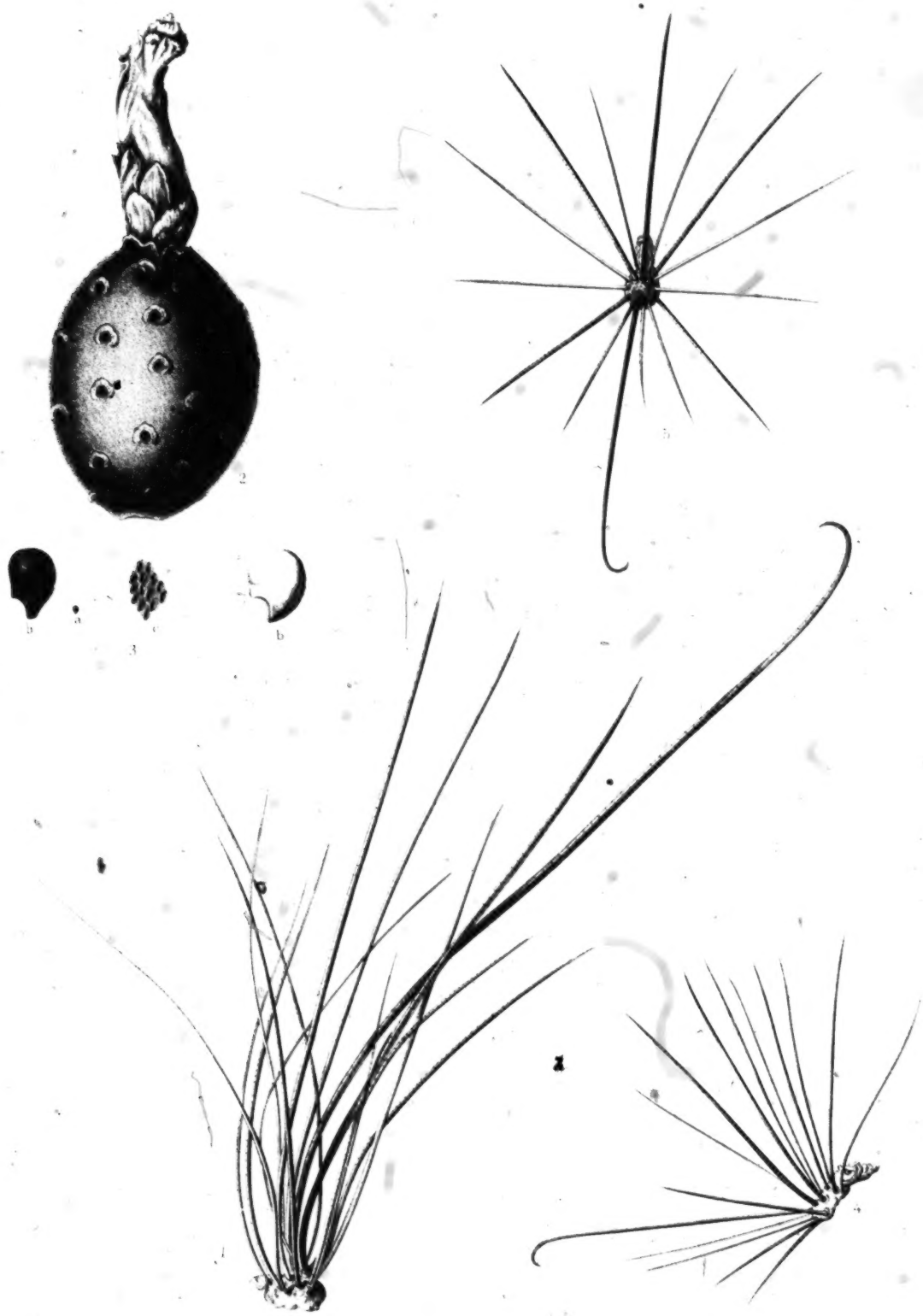

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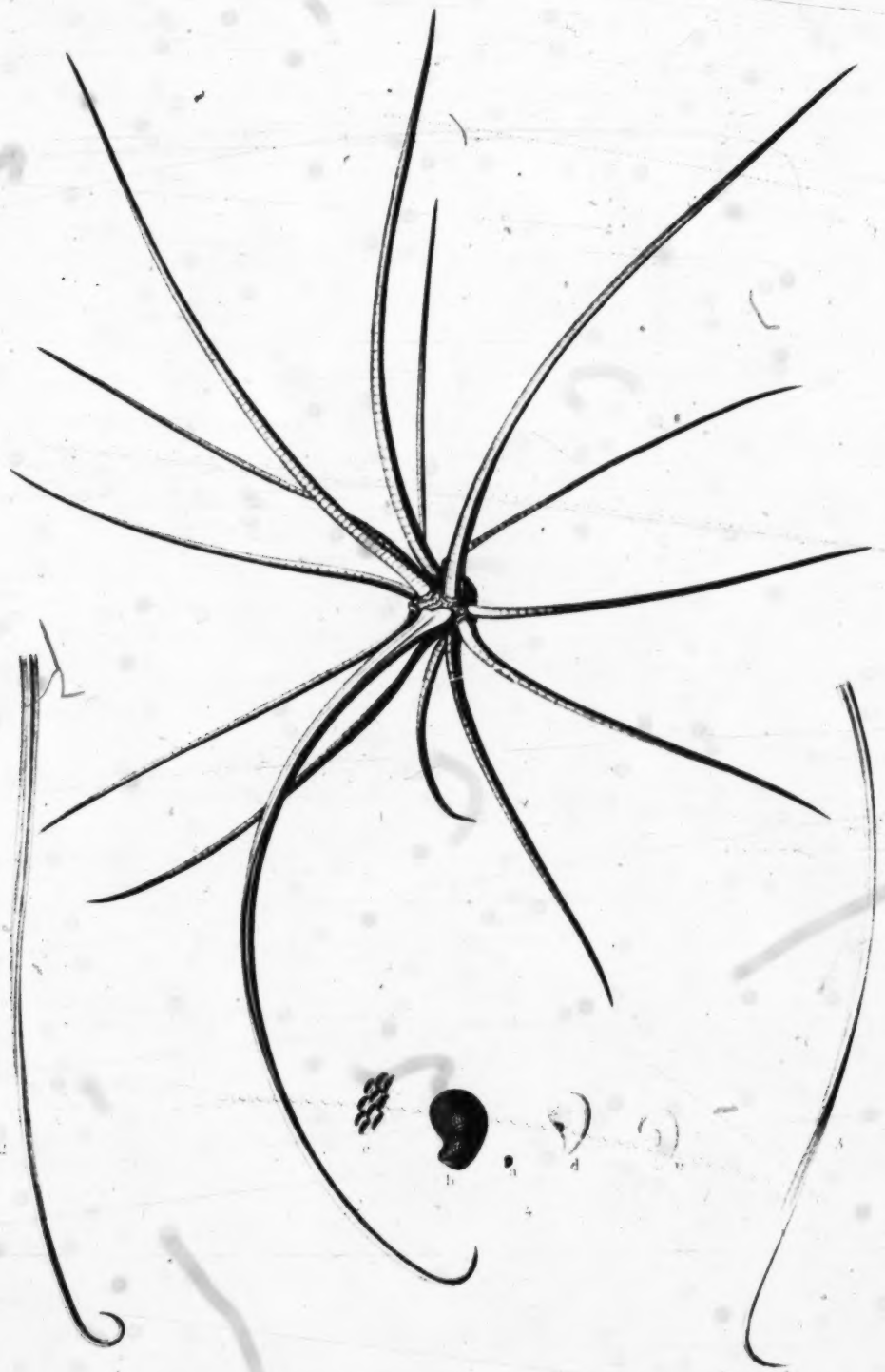

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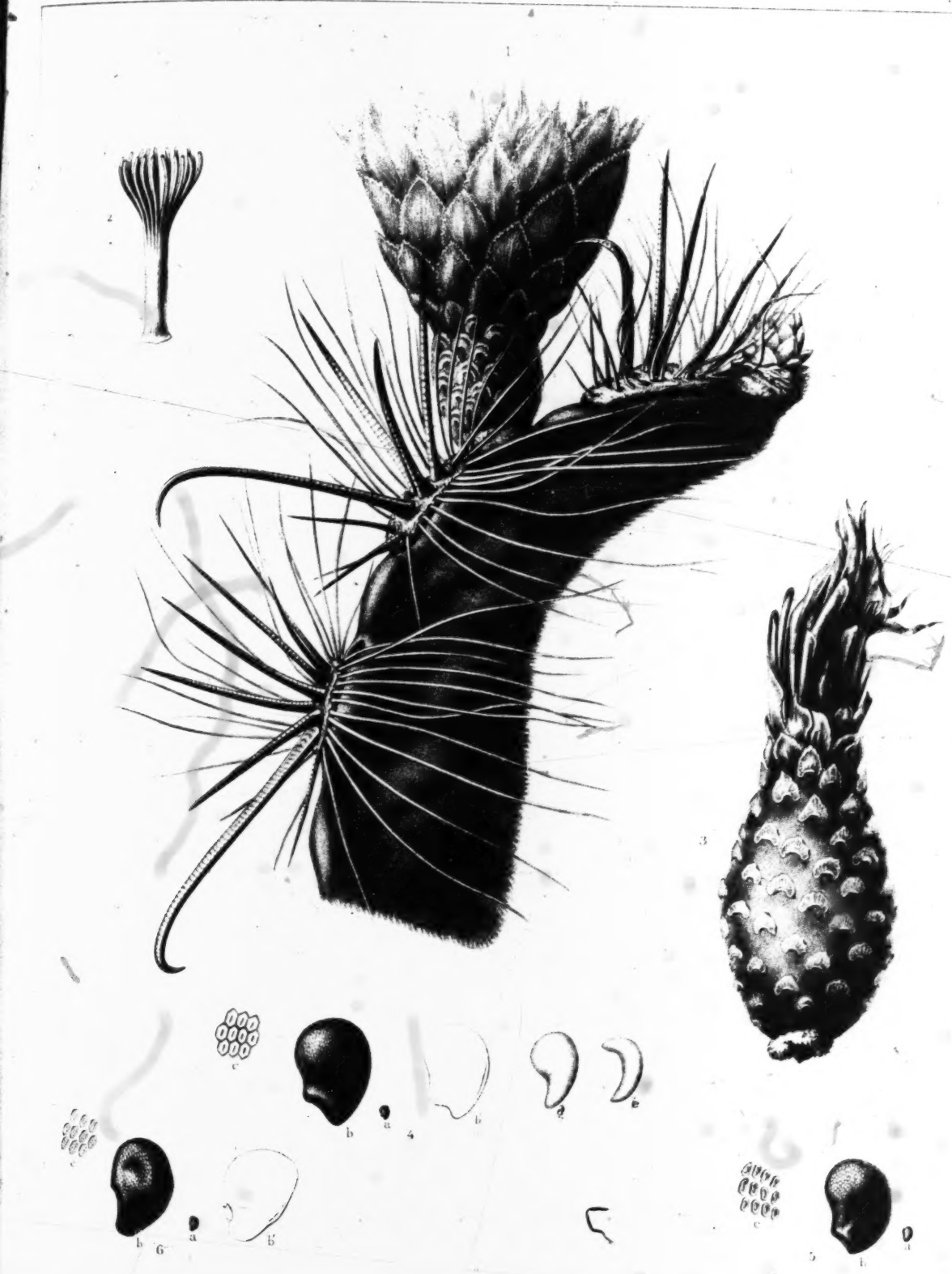

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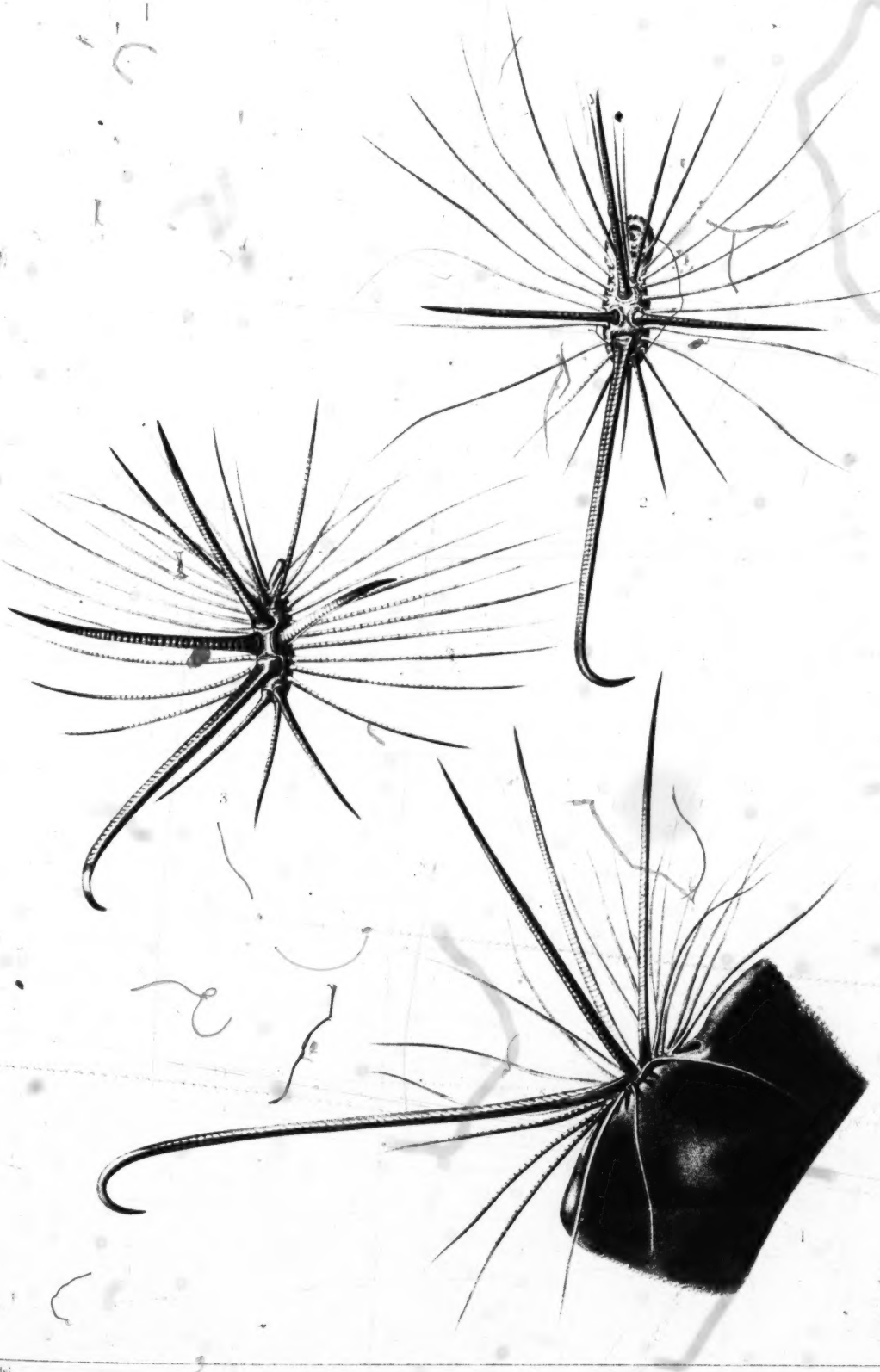

J. Porter del.

W.H. Dougal sc.

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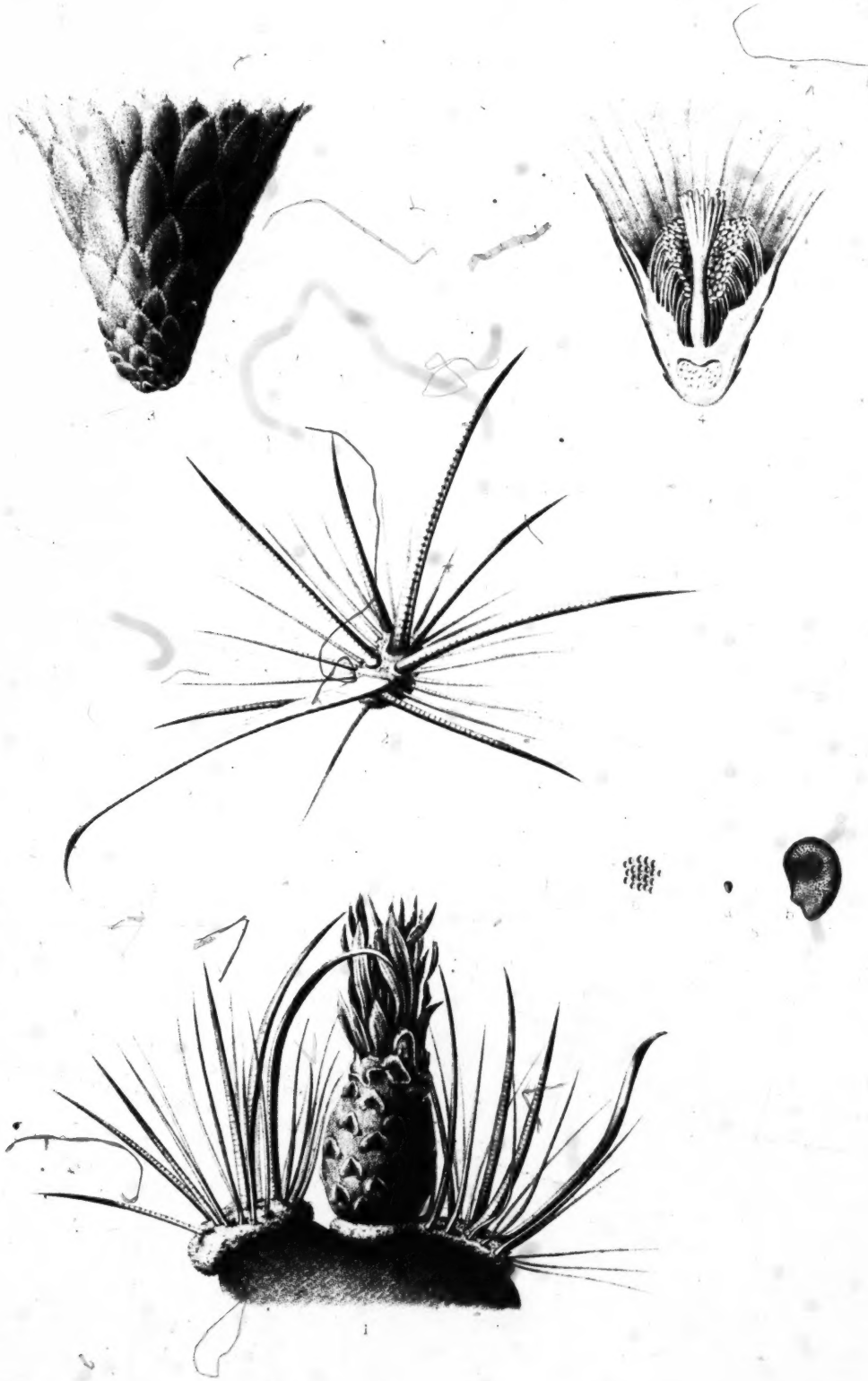

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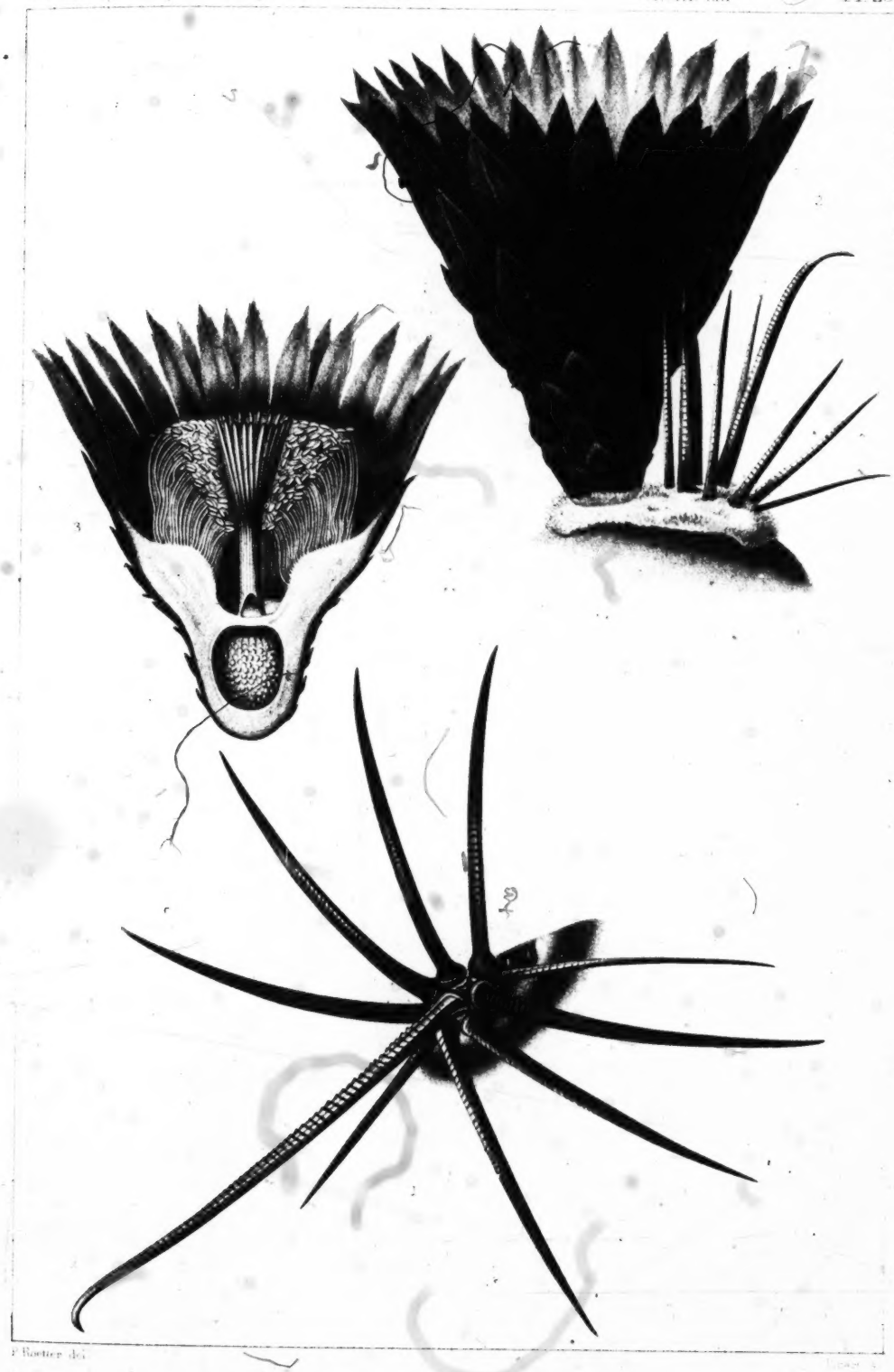

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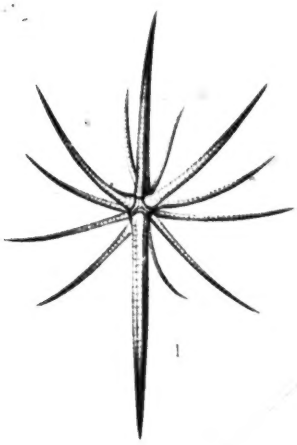

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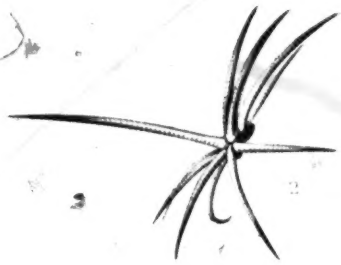

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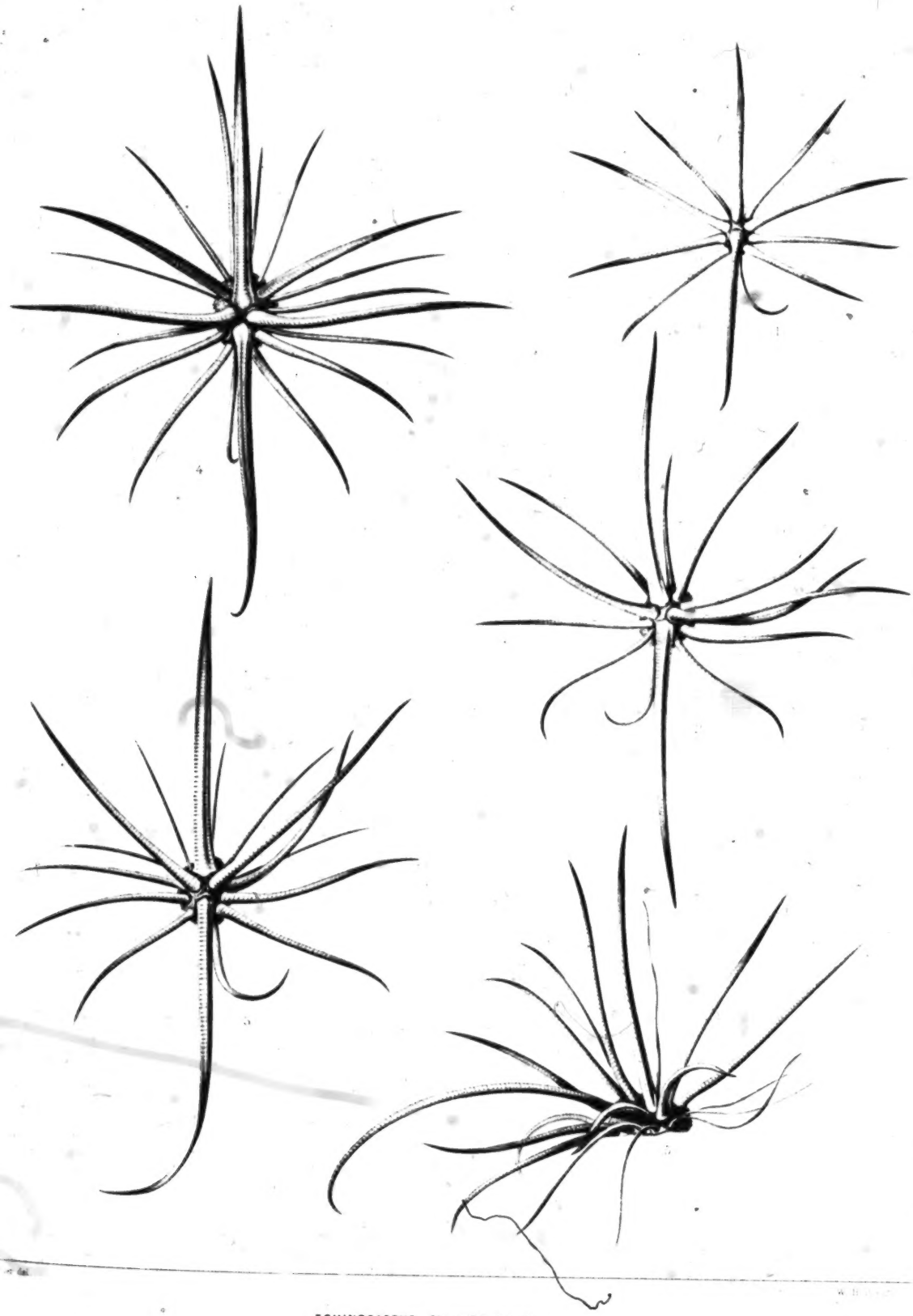
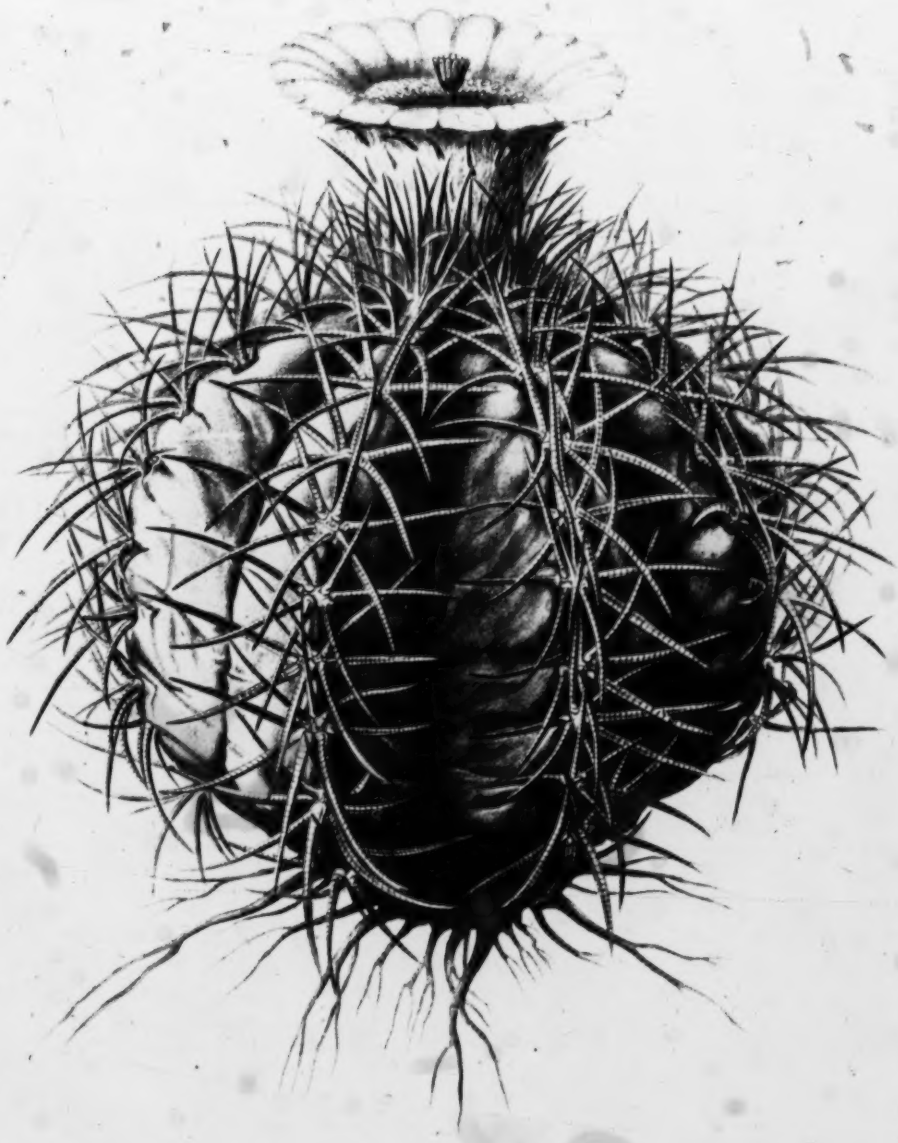
ECHINOCACTUS VIRIDESCENS



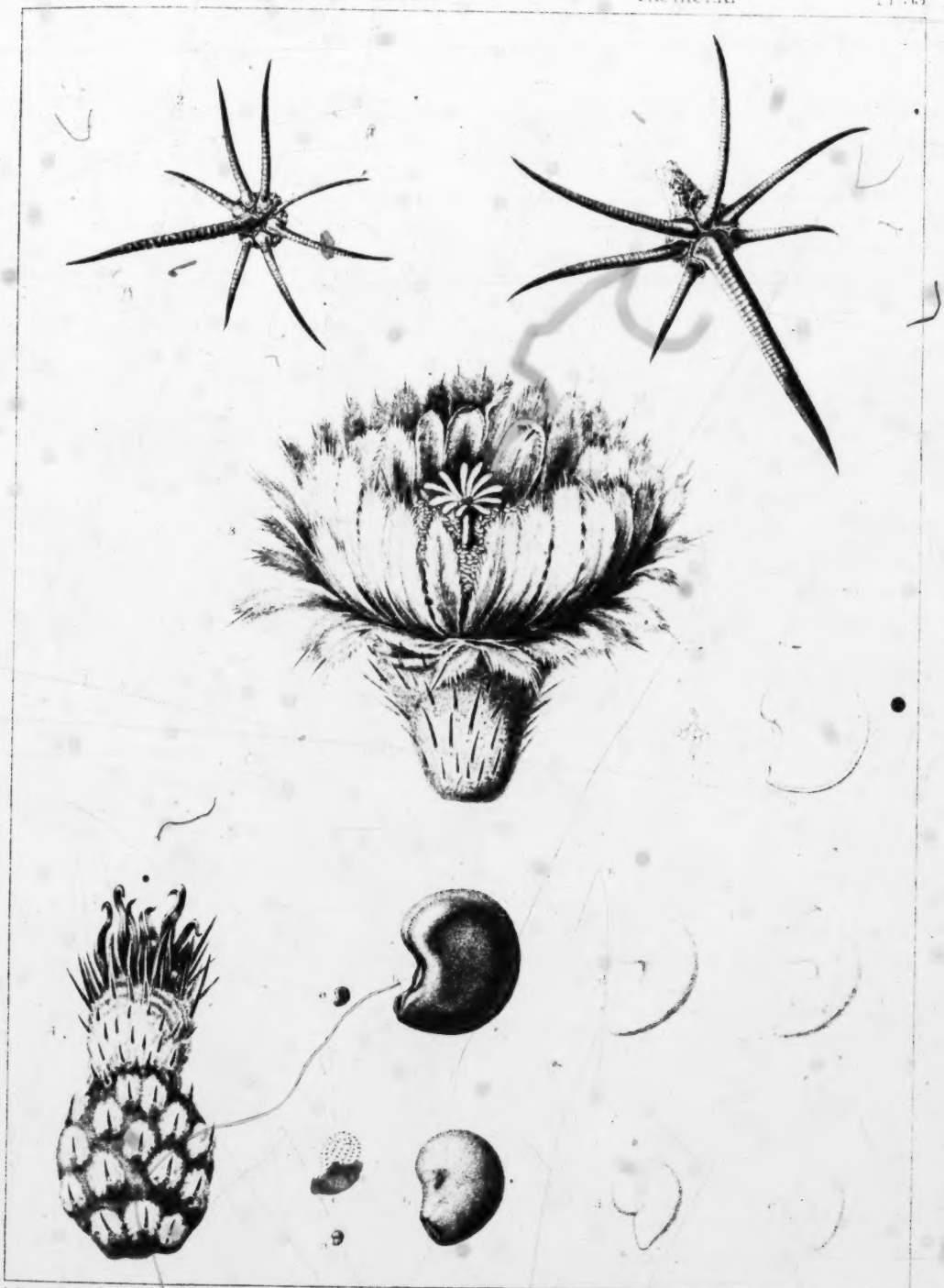
ECHINOCACTUS CYLINDRACEUS



ECHINOCACTUS HORIZONTHALONIUS

1-5 ECHINOCACTUS HORIZONTHALONIUS

6-7 ECHINOCACTUS PARRYI

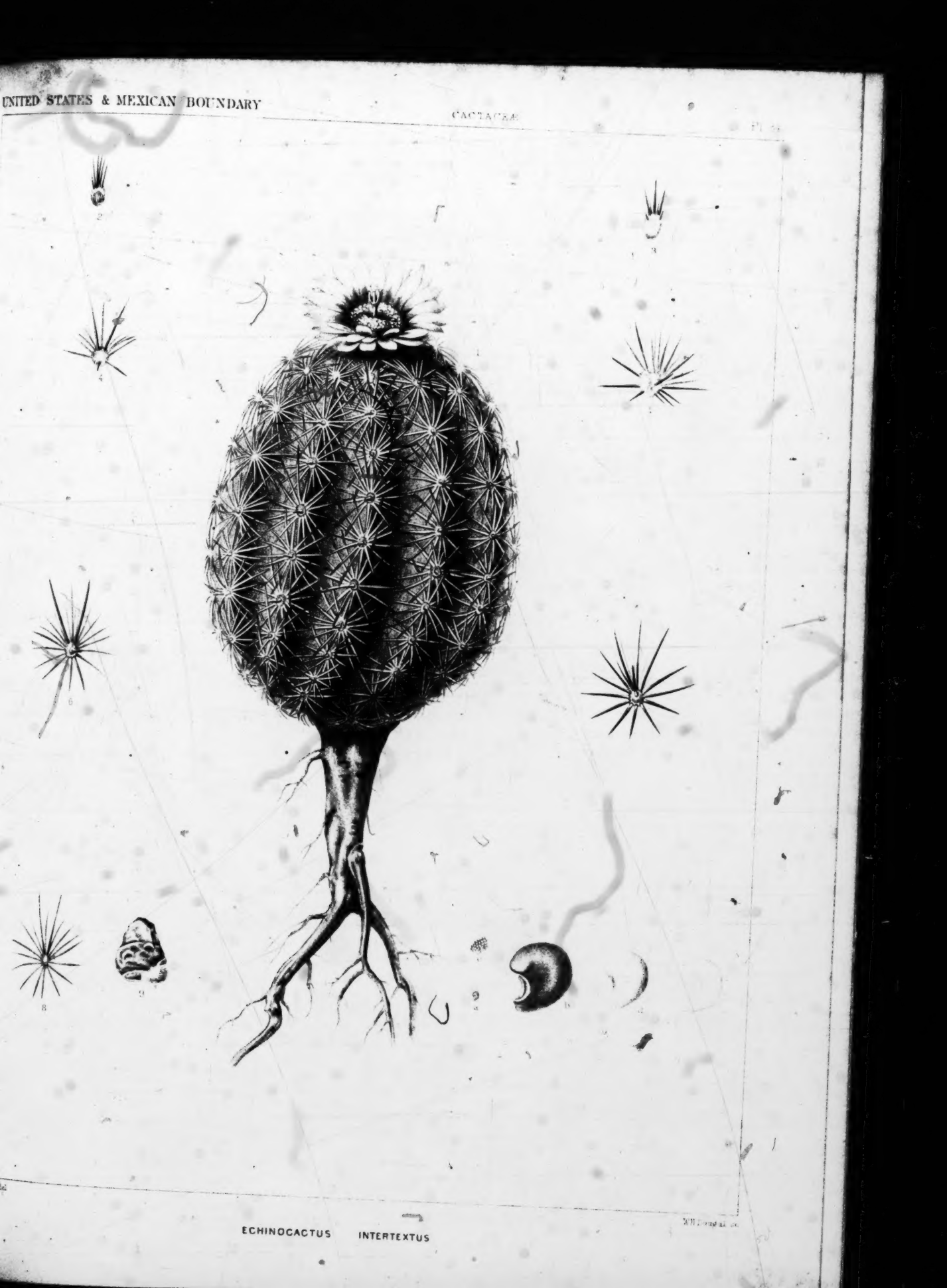


F.Roetter del.

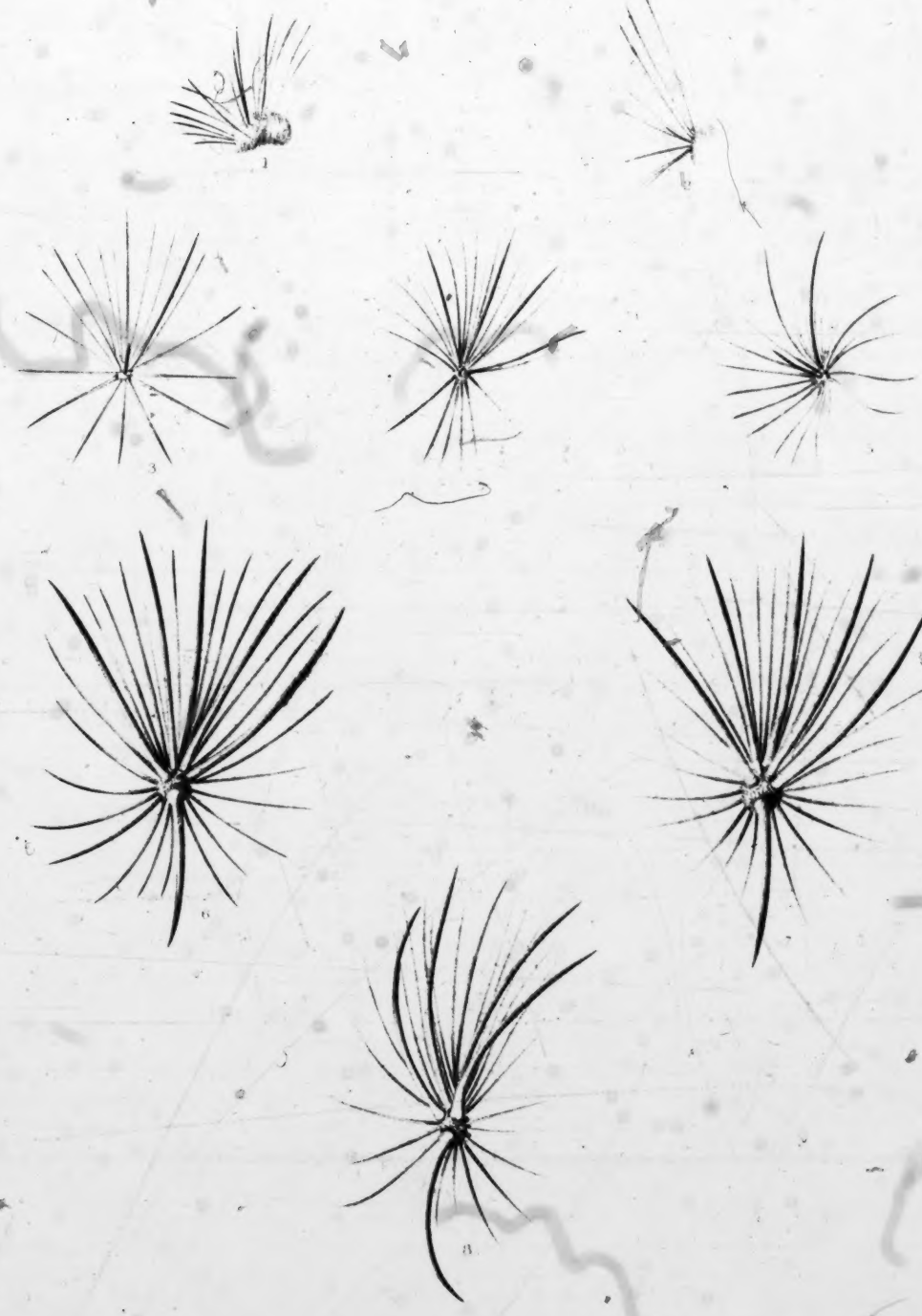
Dericaber sc.

1-6 ECHINOCACTUS TEXENSIS

7 ECHINOCACTUS SANDILLON

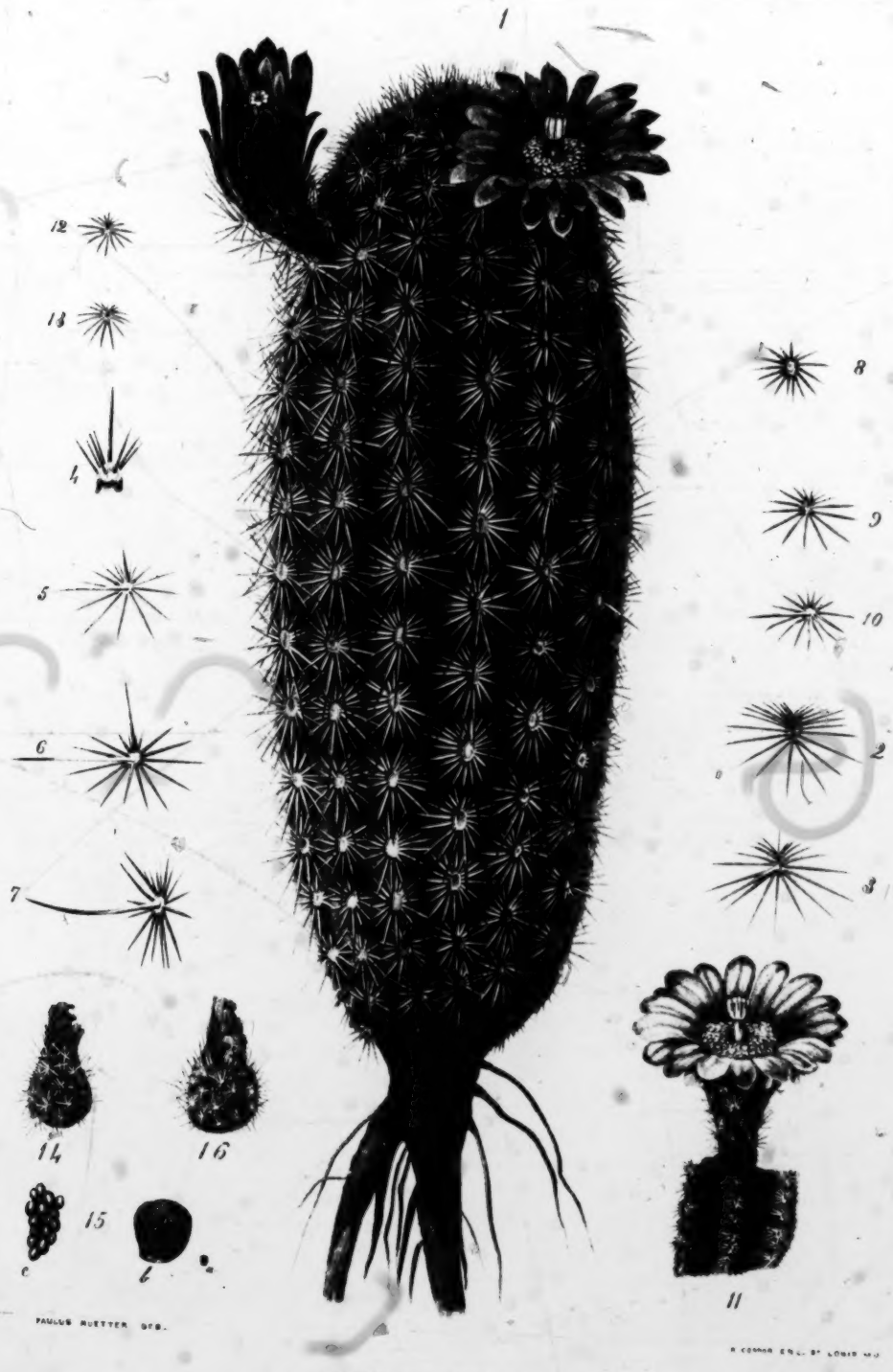


ECHINOCACTUS INTERTEXTUS



1 - 5 ECHINOCACTUS INTERTEXTUS VAR. DASYACANTHUS

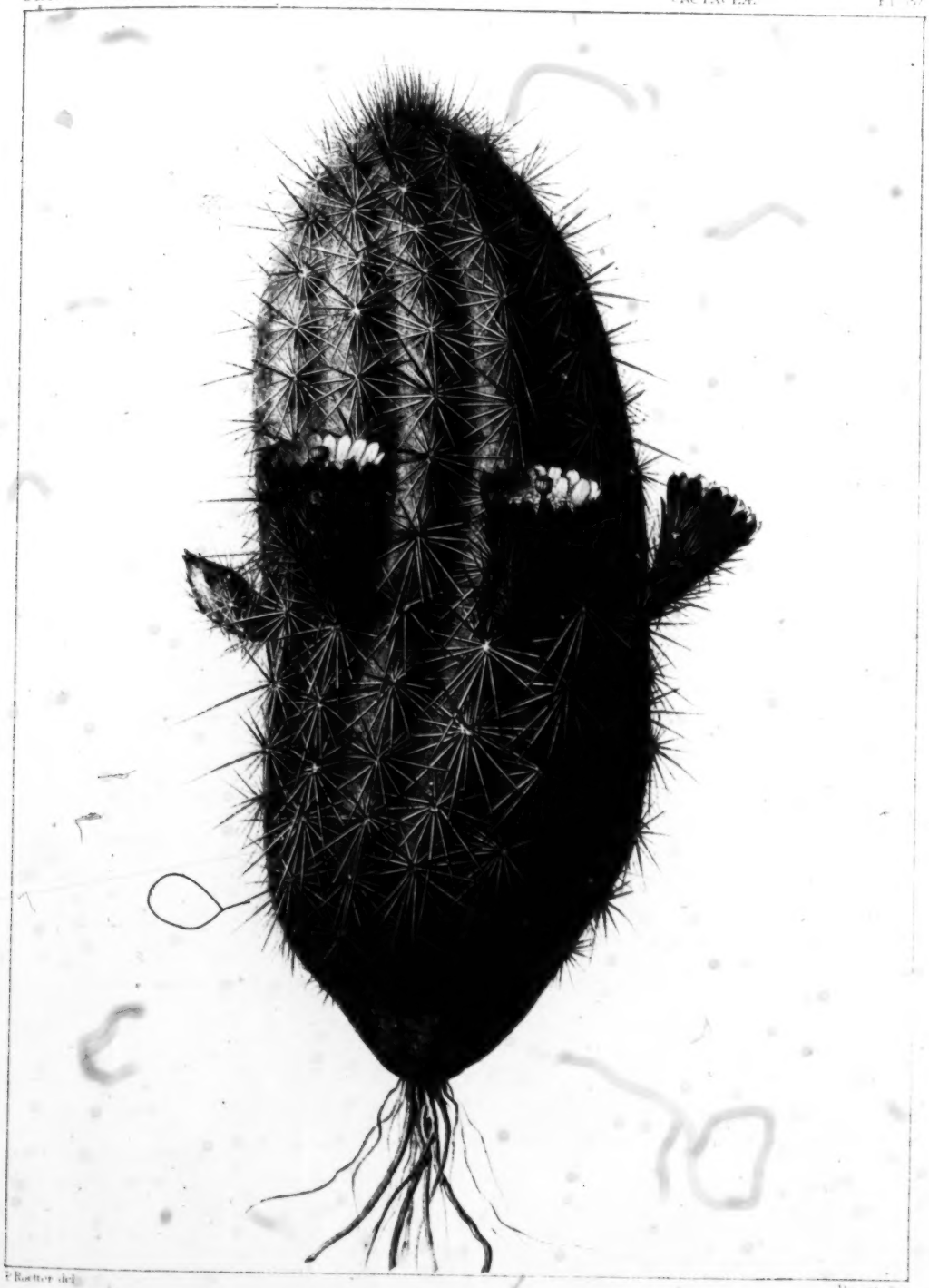
6 - 8 ECHINOCACTUS UNGUISPINUS



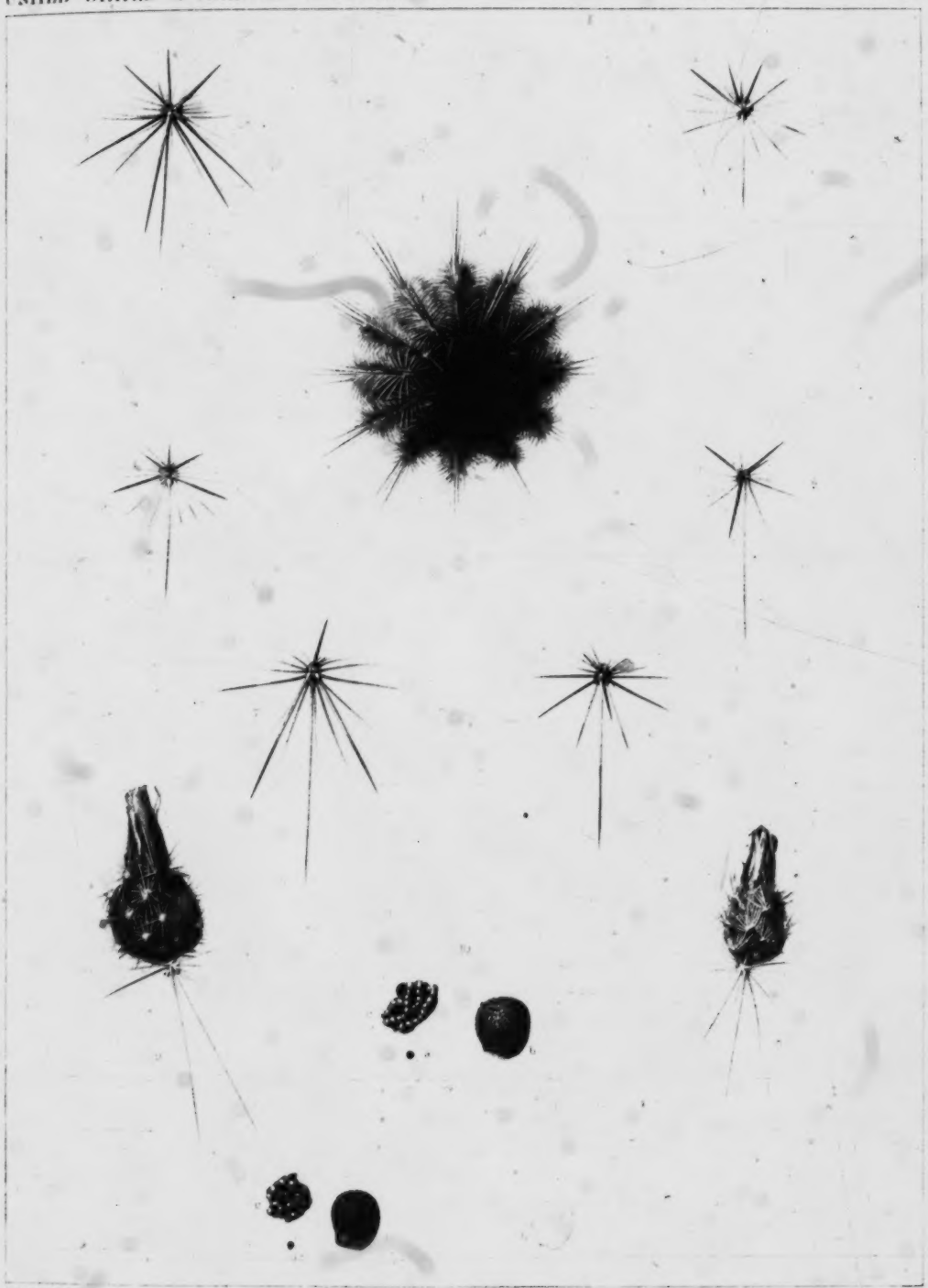
PAULUS KUETTER DEL.

R. CONNOR ENGR. ST. LOUIS MO.

CEREUS VIRIDIFLORUS



CEREUS CHLORANTHUS



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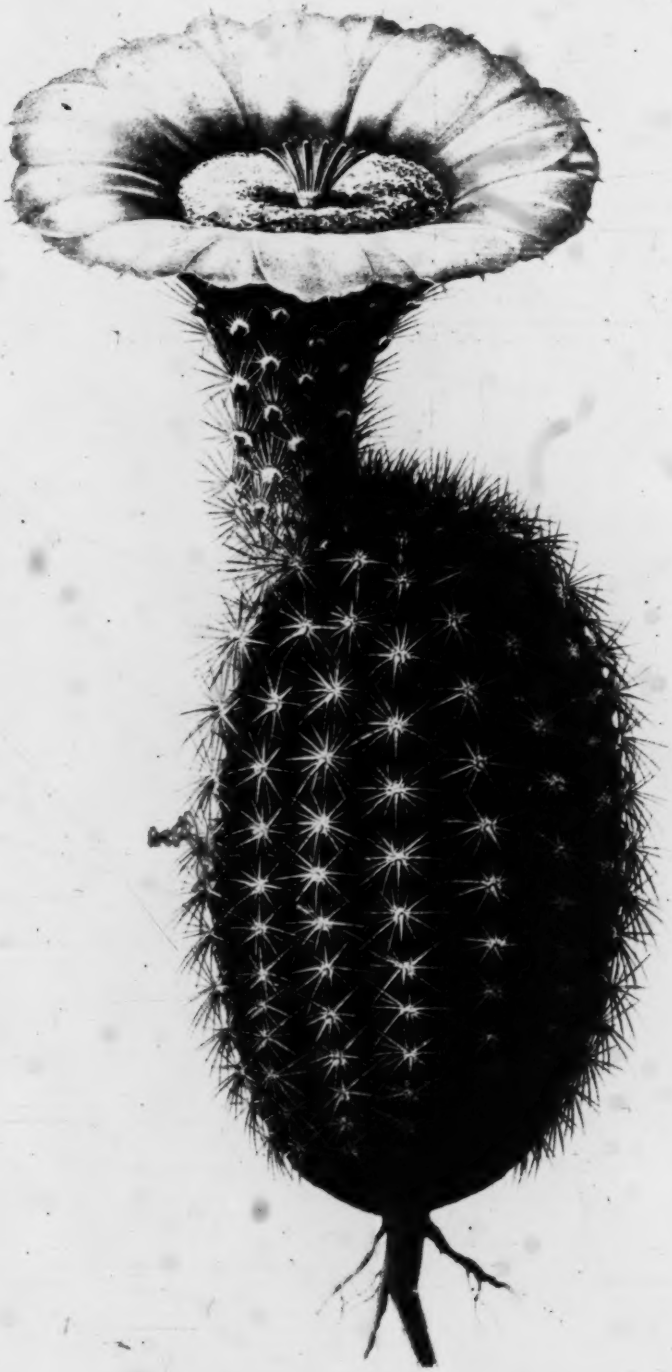
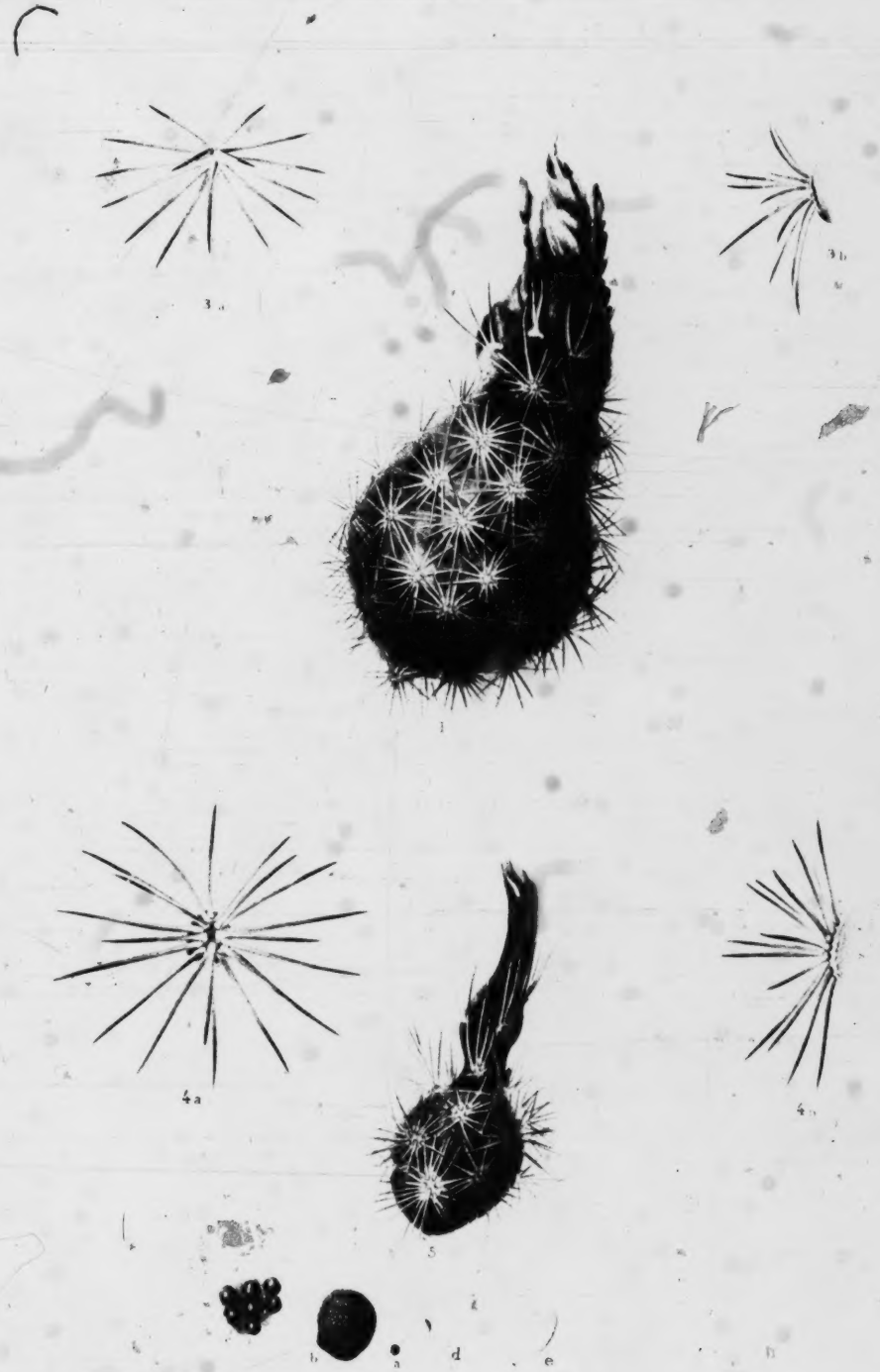


Roemer del. Dougal sc.

CEREUS DASYACANTHUS

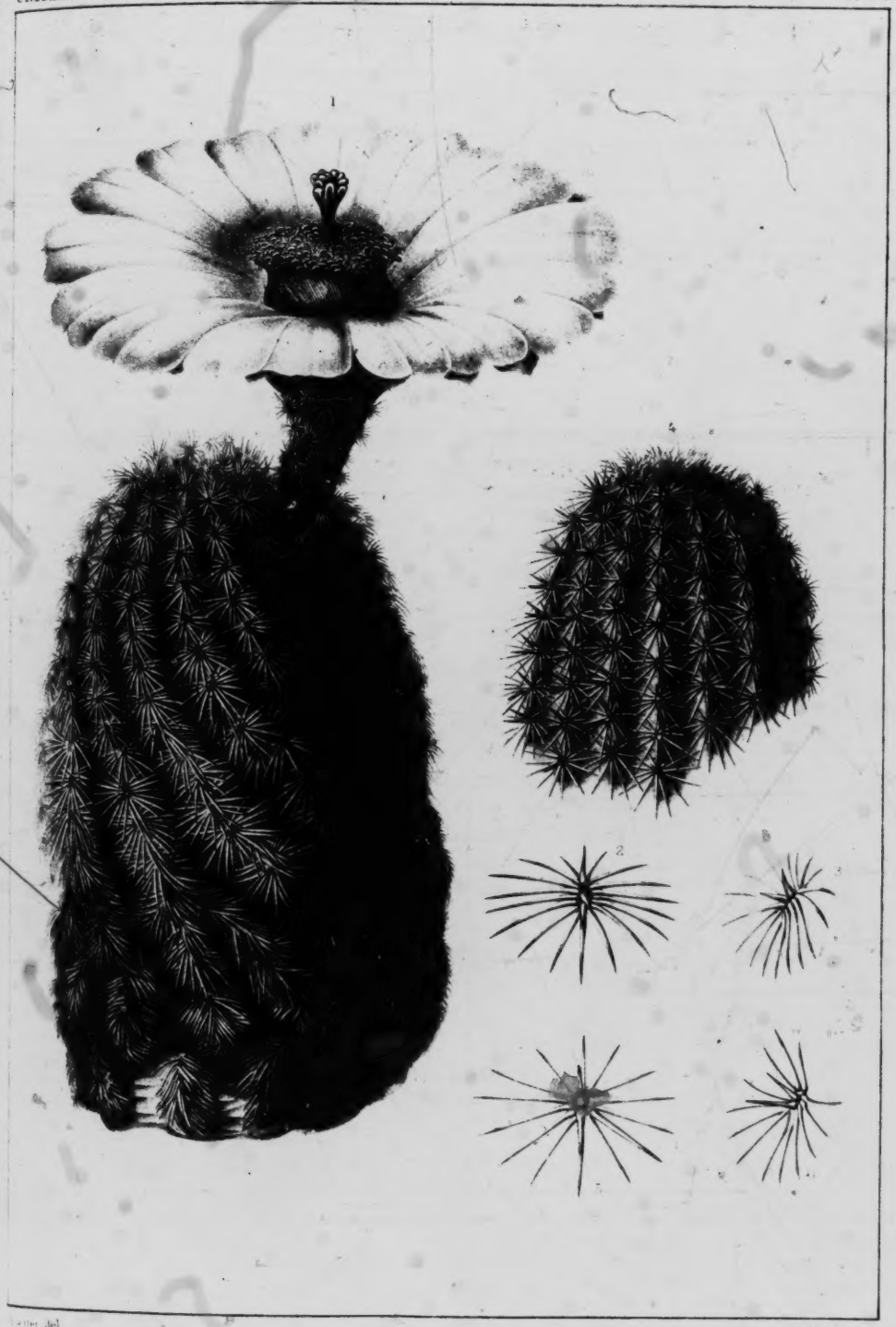
CEREUS DASYACANTHUS



J.Roetter del.

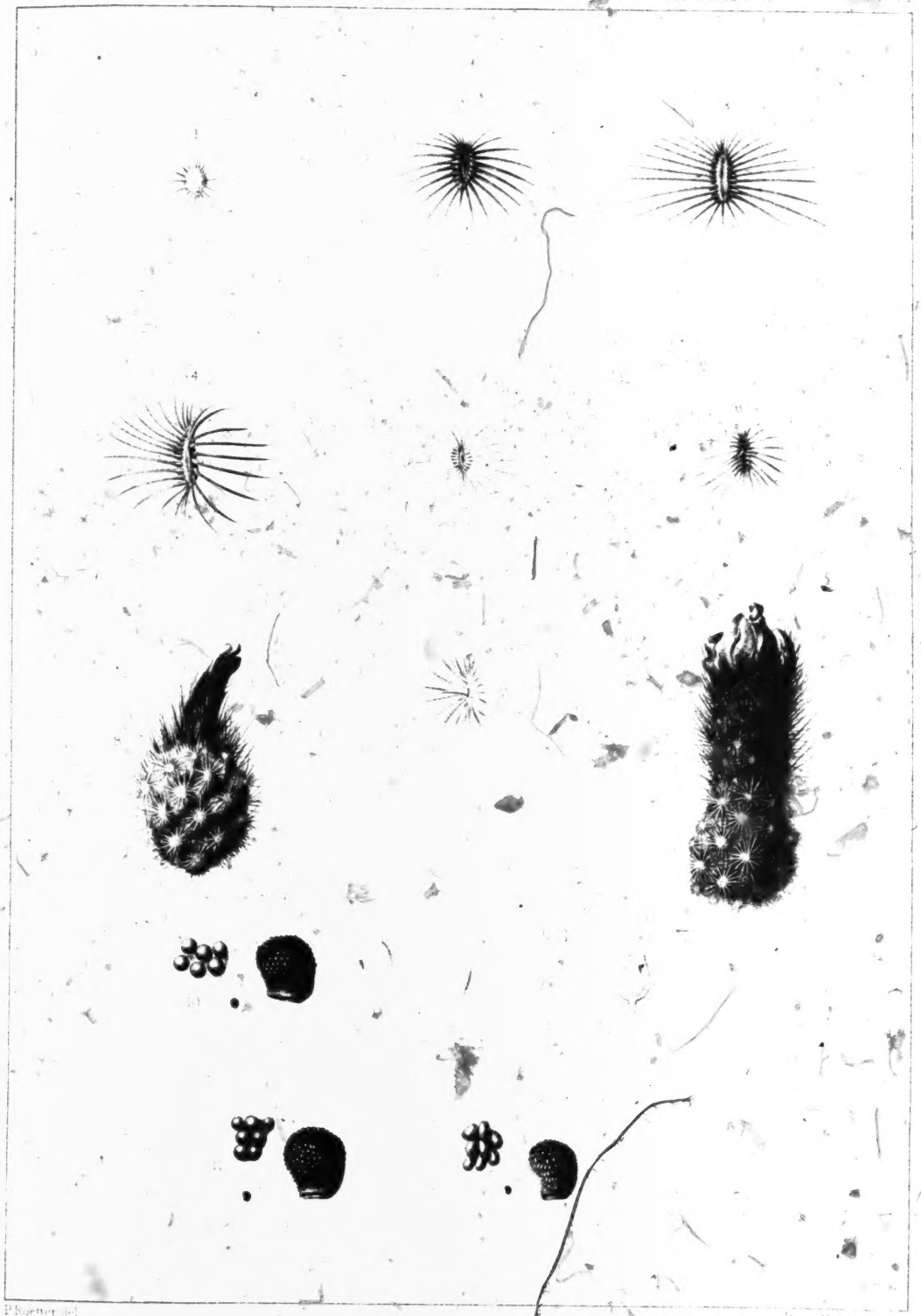
Dougal sc

1-2 CEREUS DASYACANTHUS
3-5 " ROETTERI



CEREUS CTENOIDES

CEREUS CÆSPITOSUS



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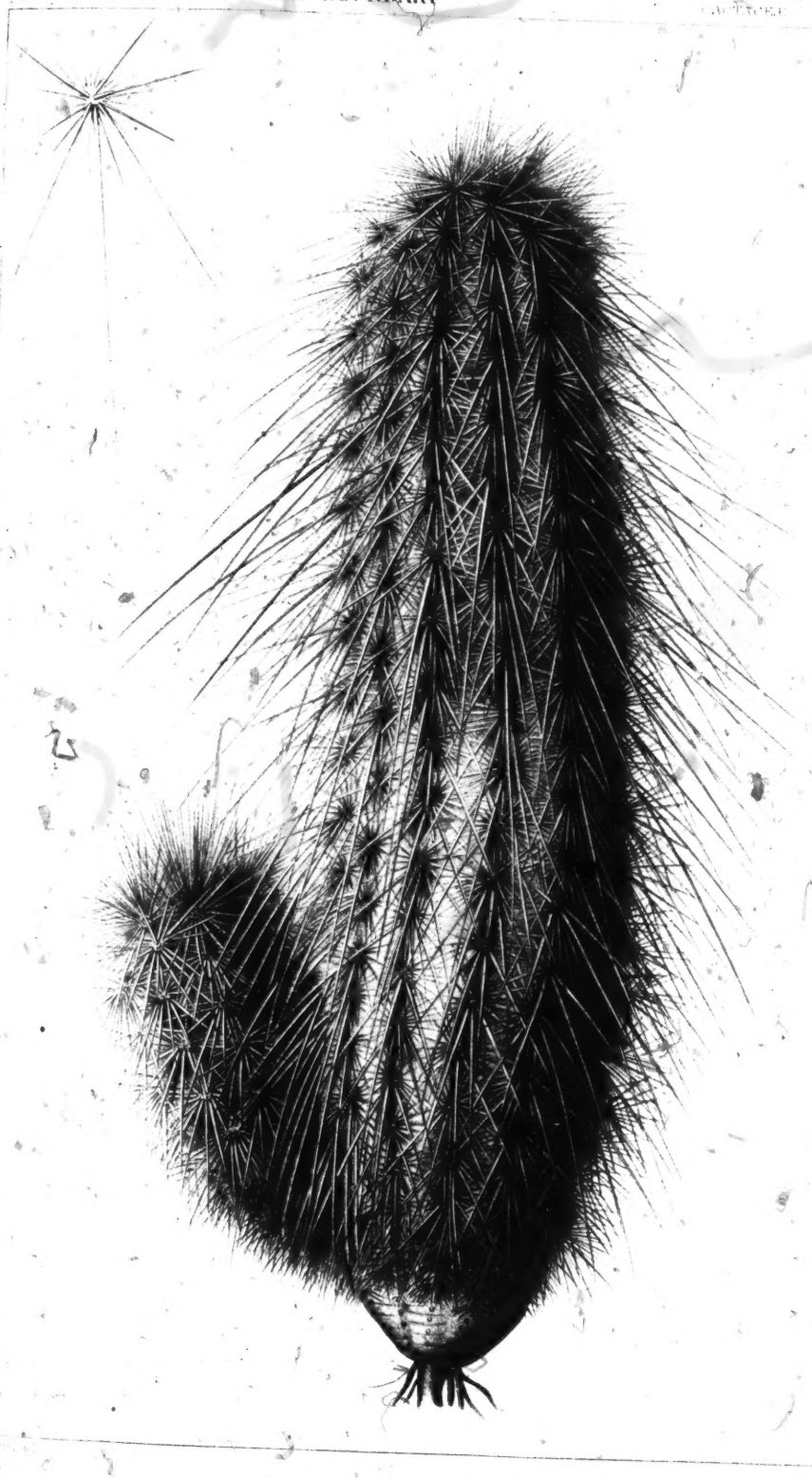

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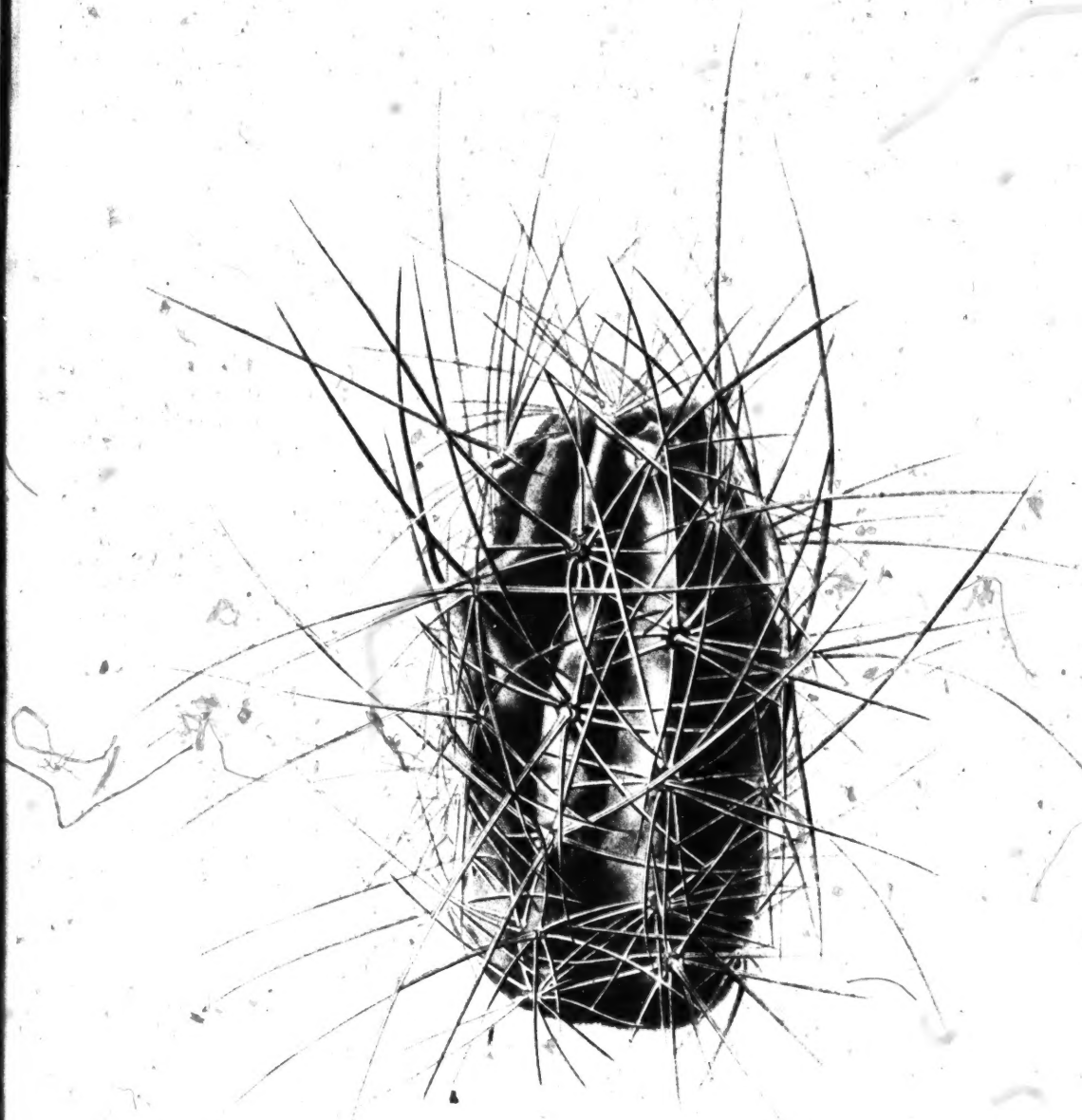
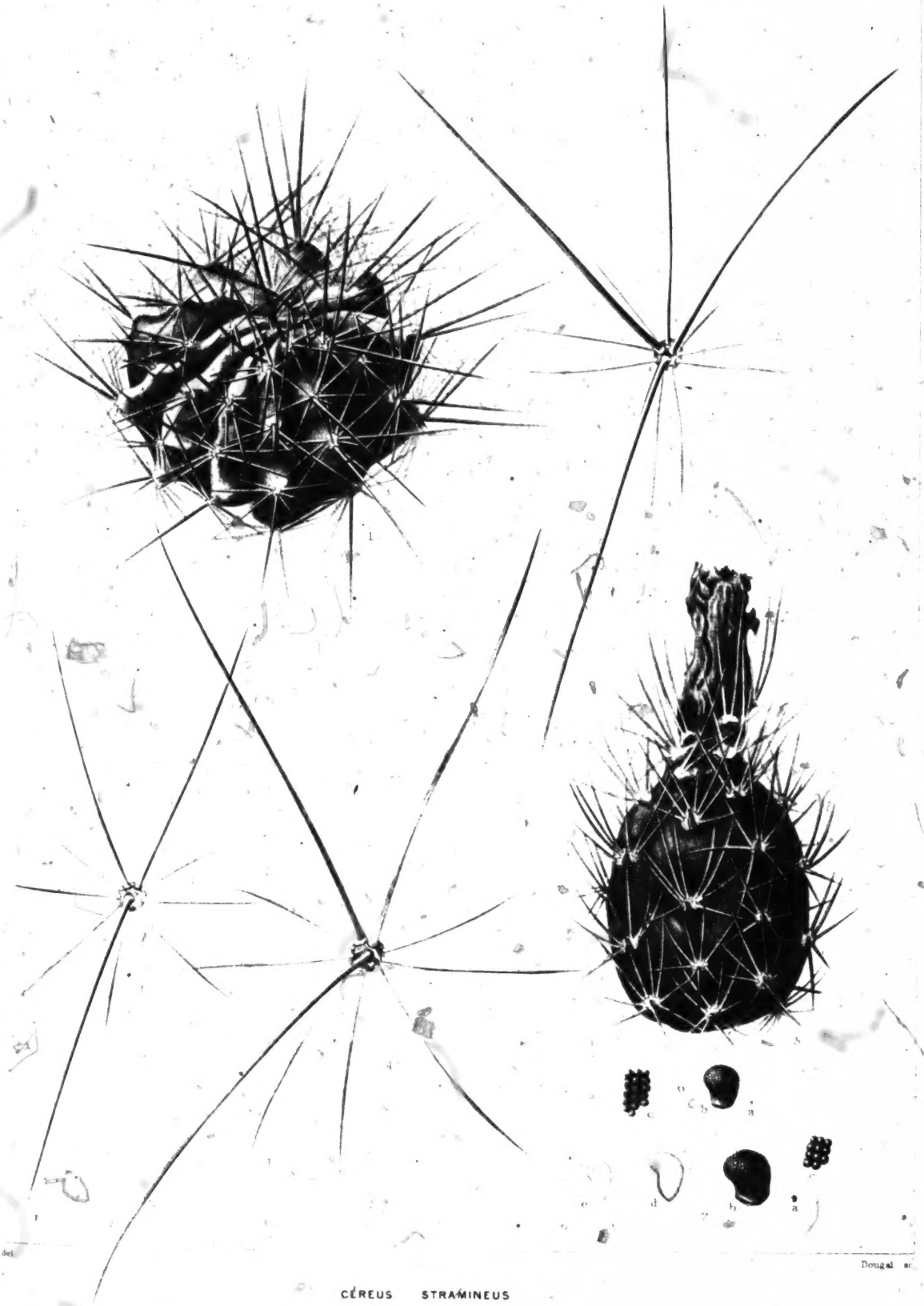


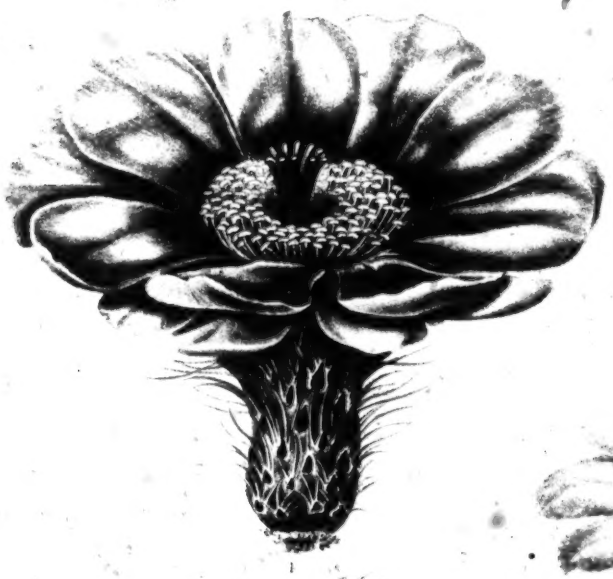
Boller del

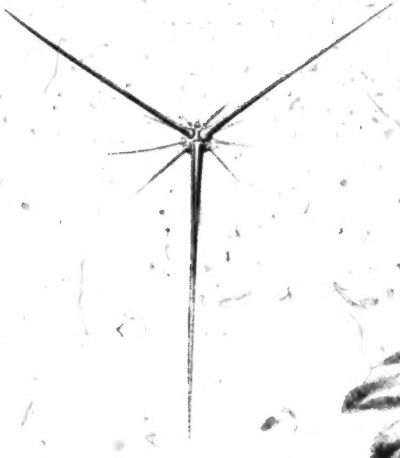
CEREUS STRAMINEUS



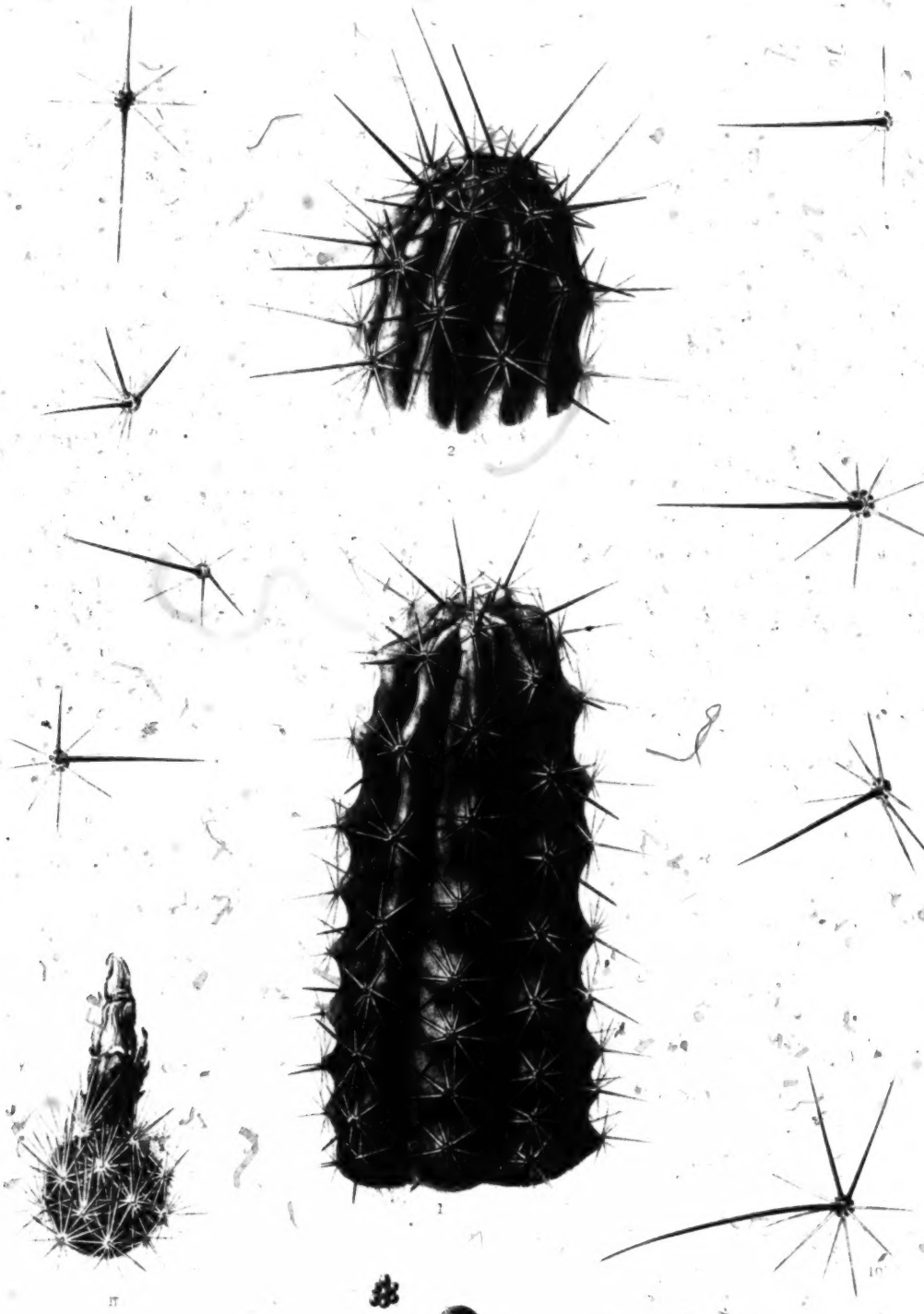
Thurber del. Dougal sc

CEREUS STRAMINEUS





1 CEREUS STRAMINEUS 2 4 CEREUS ENNEACANTHUS



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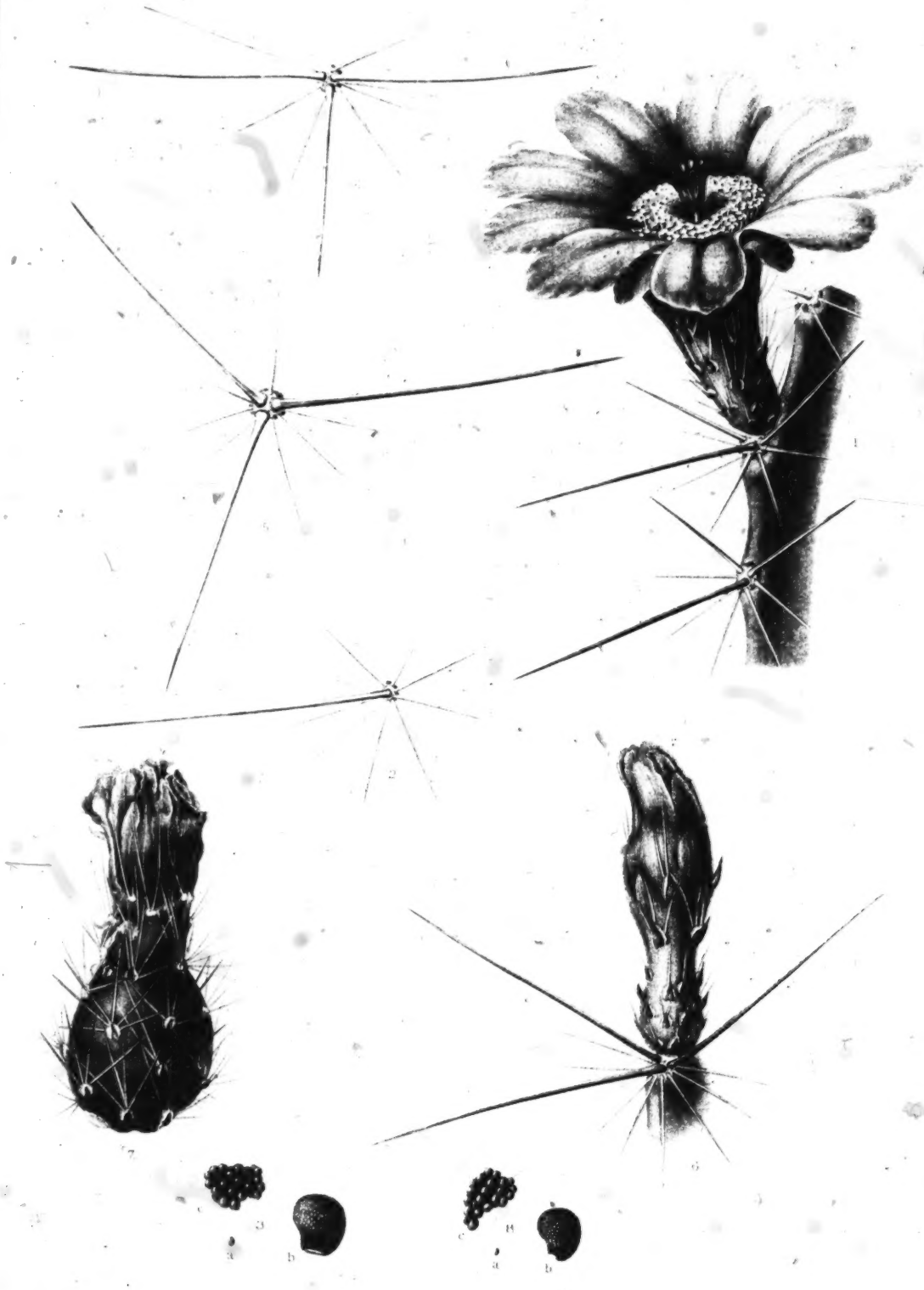
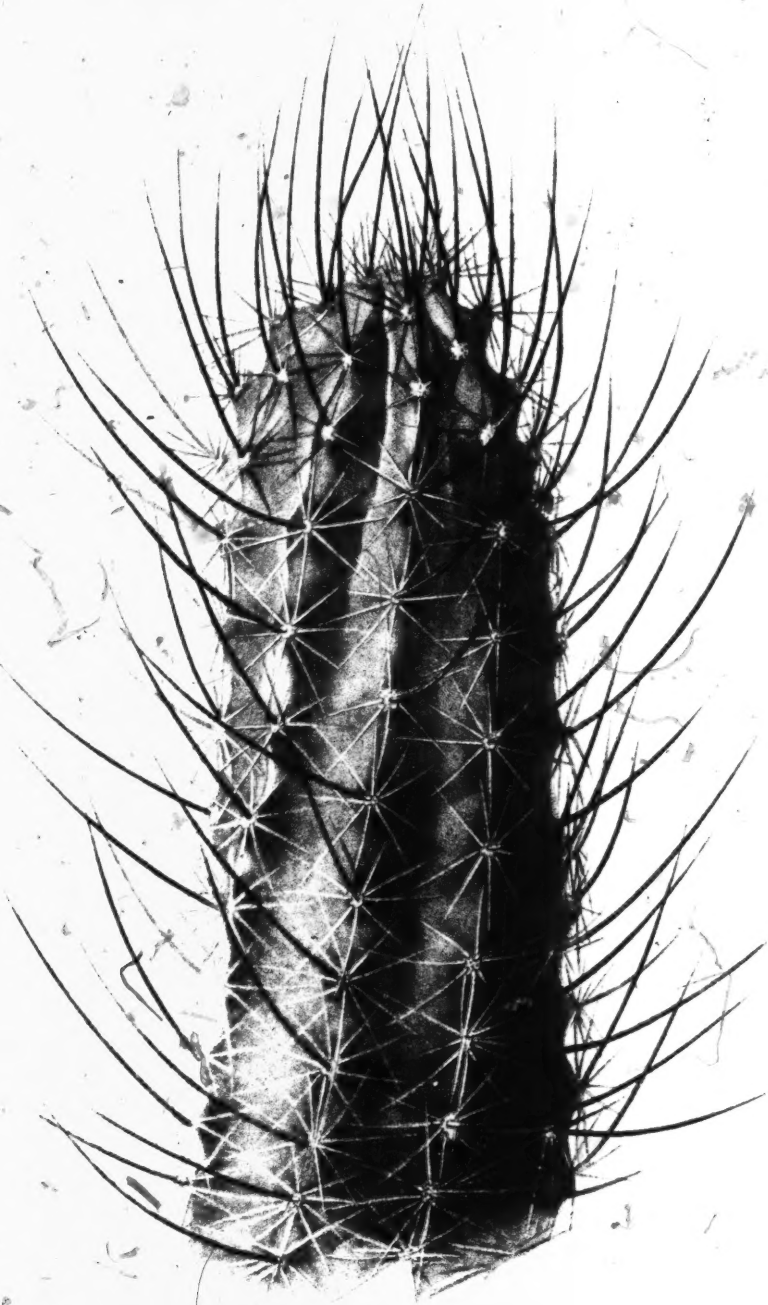
CEREUS ENNEACANTHUS



CEREUS DUBIUS

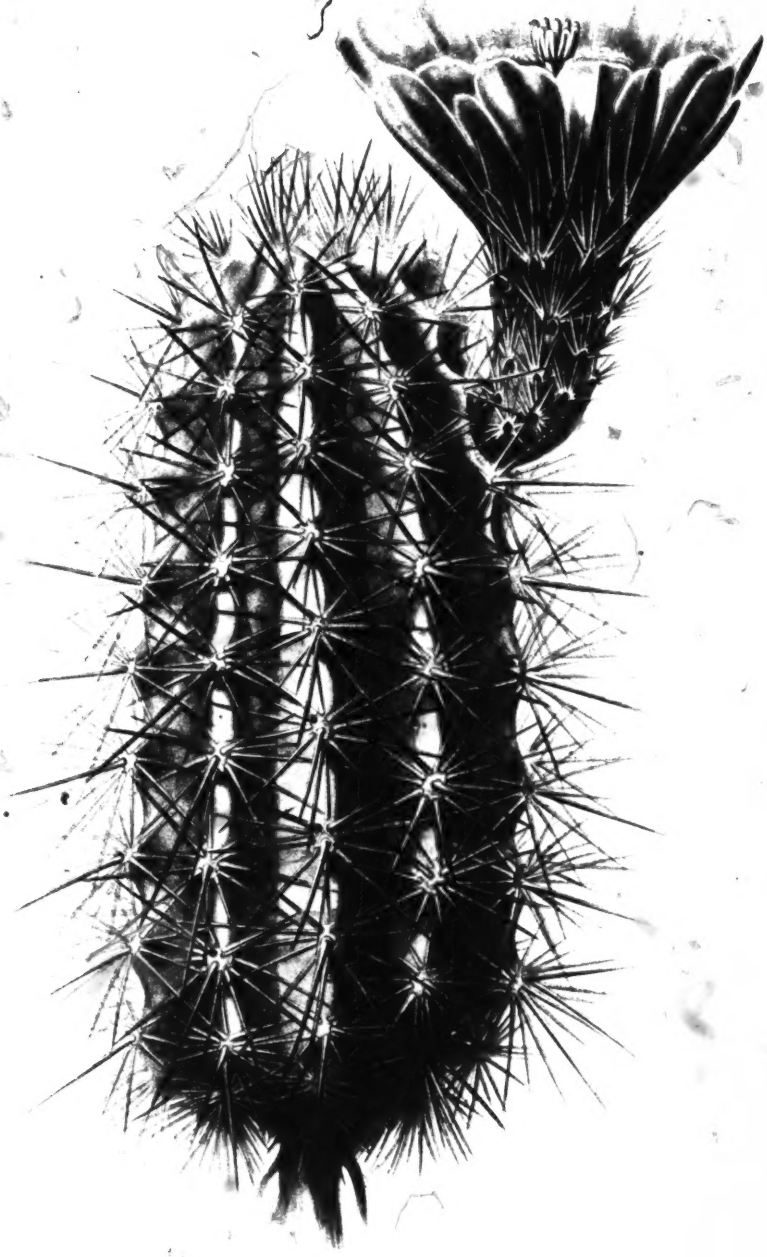


CEREUS FENDLERI

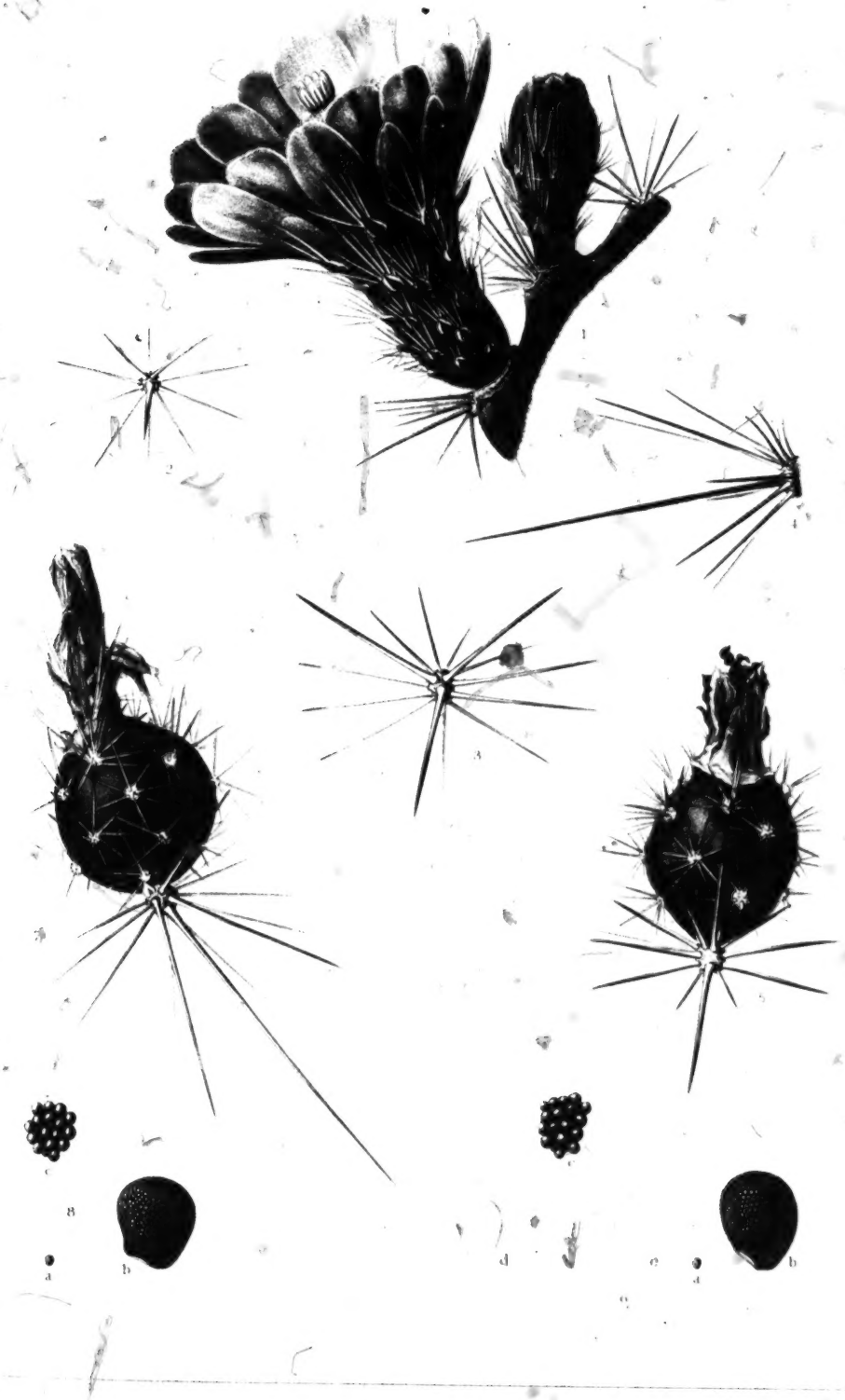
CEREUS FENDLERI

UNITED STATES & MEXICAN BOUNDARY

CEREUS FENDLERI



CEREUS POLYACANTHUS



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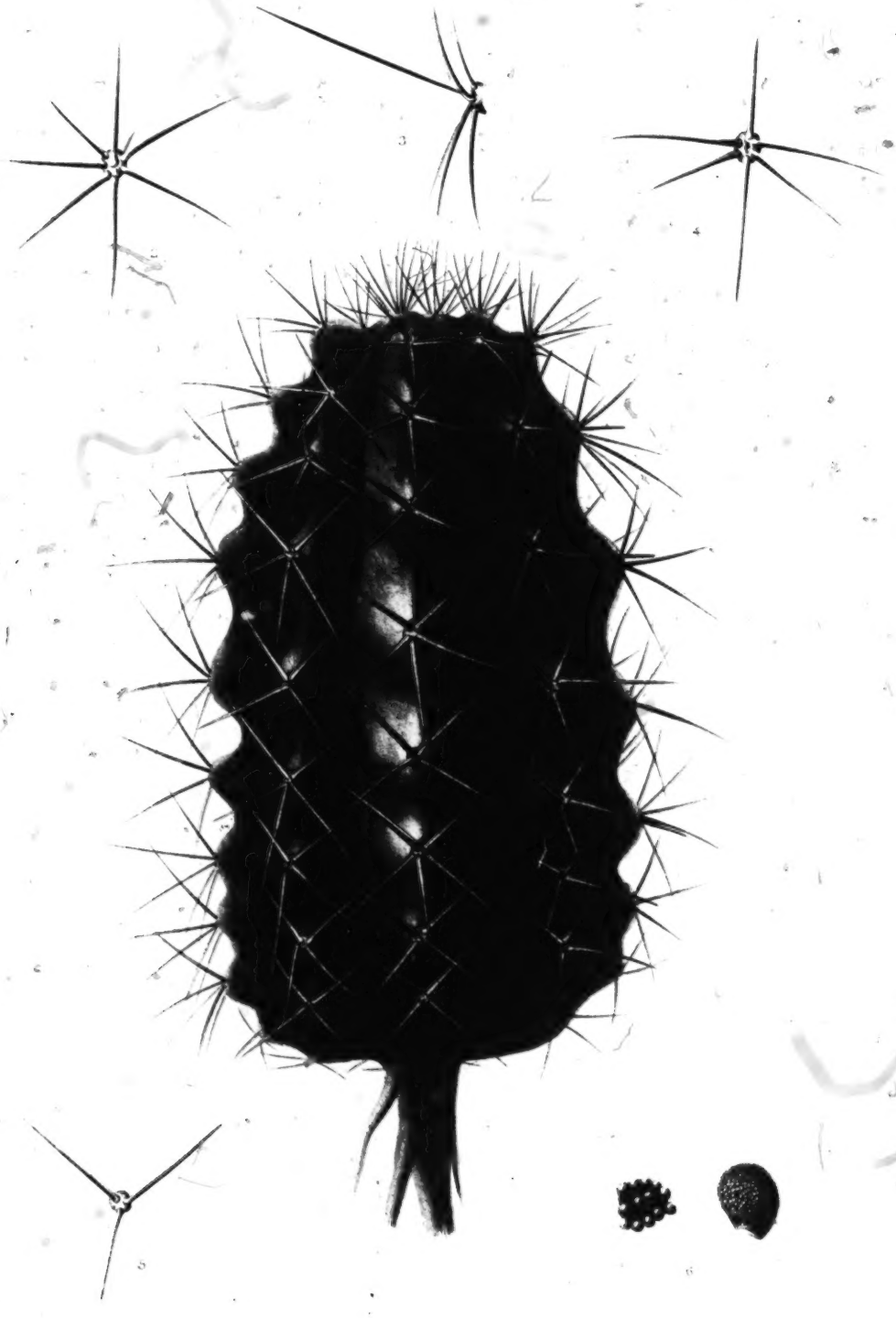
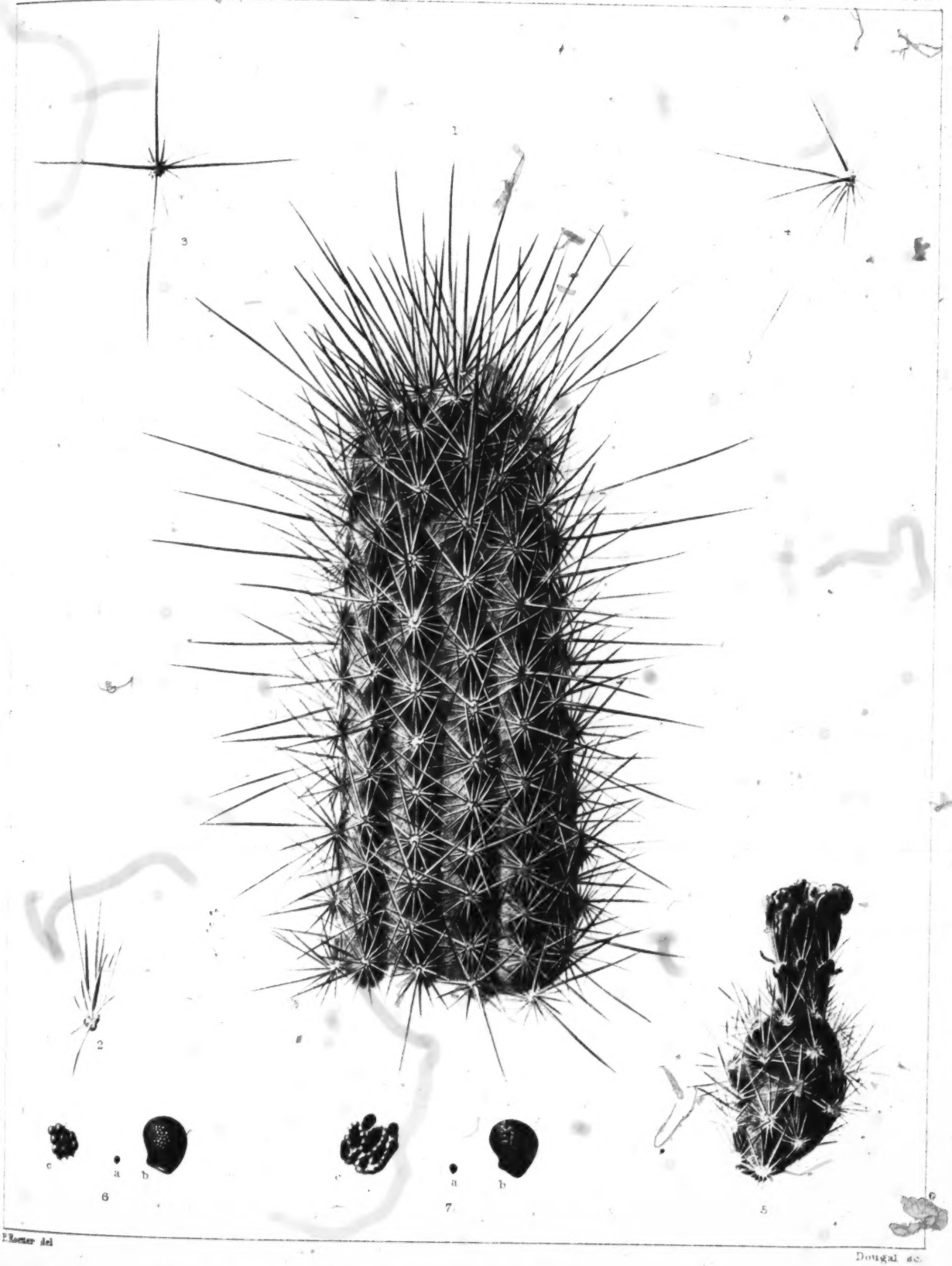


P.Roetter del.

Dougal sc

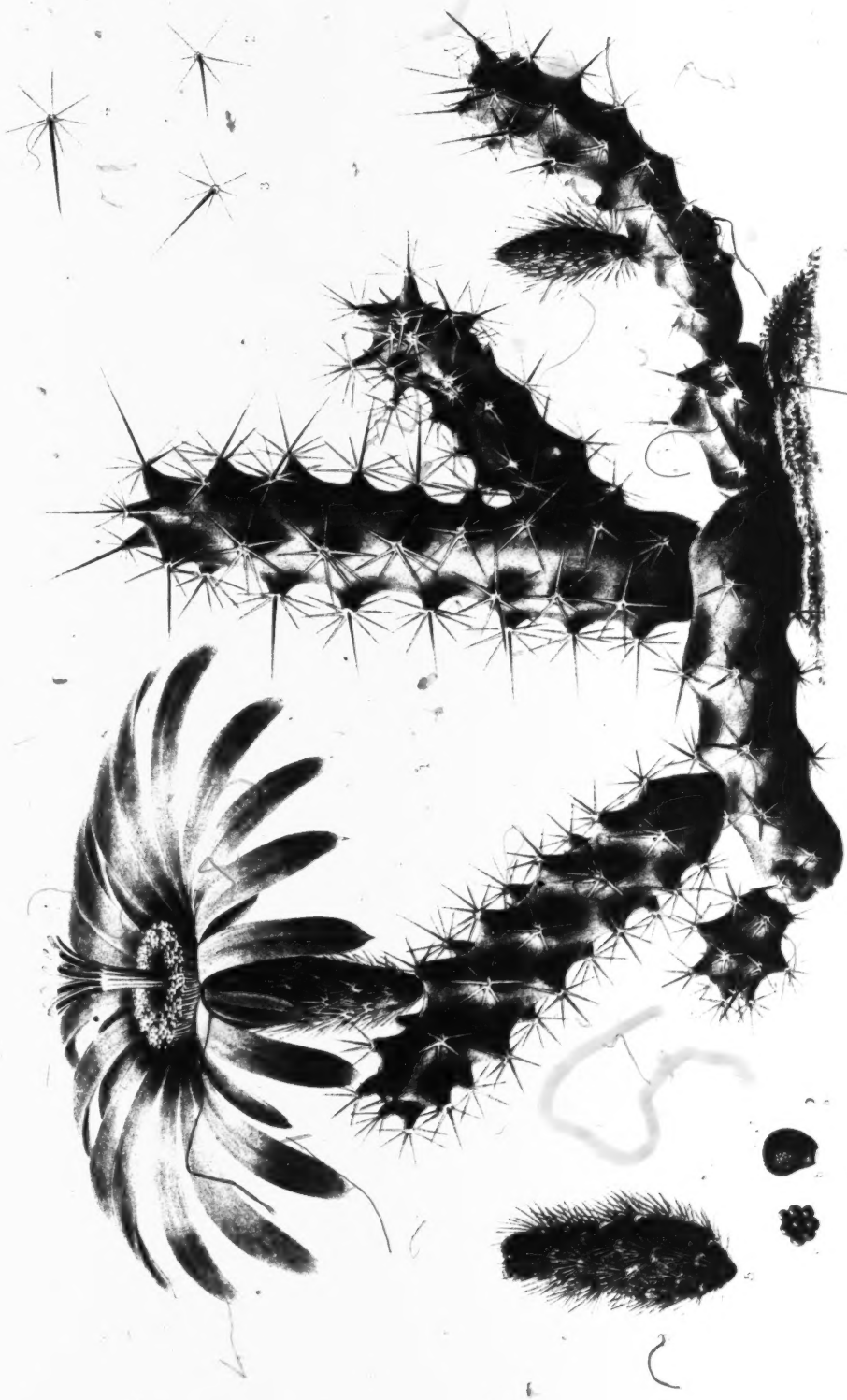
CEREUS PAUCISPINUS



F.Kreutzer del

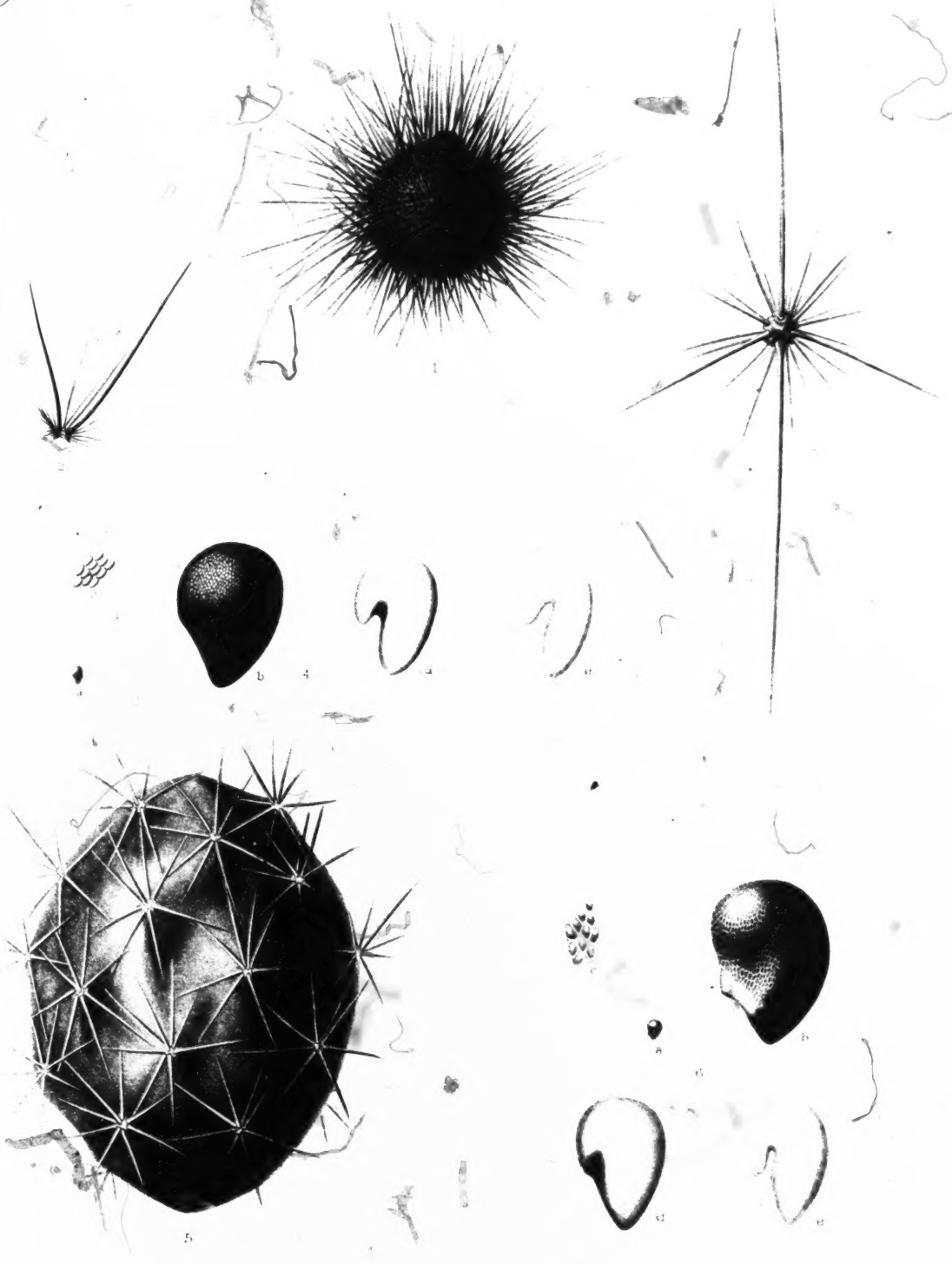
Dougal sc.

CEREUS ENGELMANNI

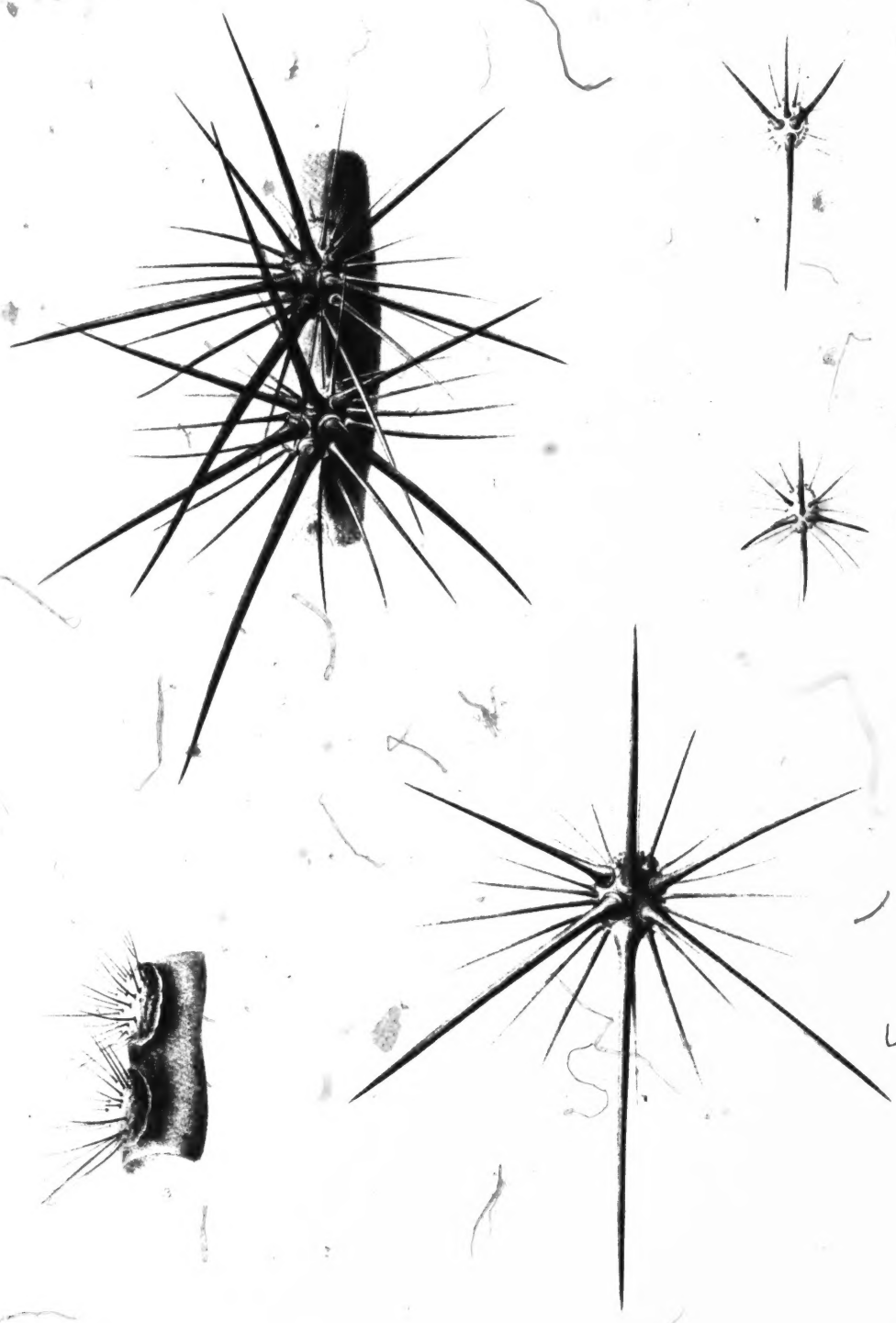


CEREUS BERLANDIERI

1 - 11 CEREUS PROCUMBENS
12 " TUBEROSUS



1 4 CEREUS EMORYI 5 6 CEREUS VARIABILIS



CEREUS GIGANTEUS

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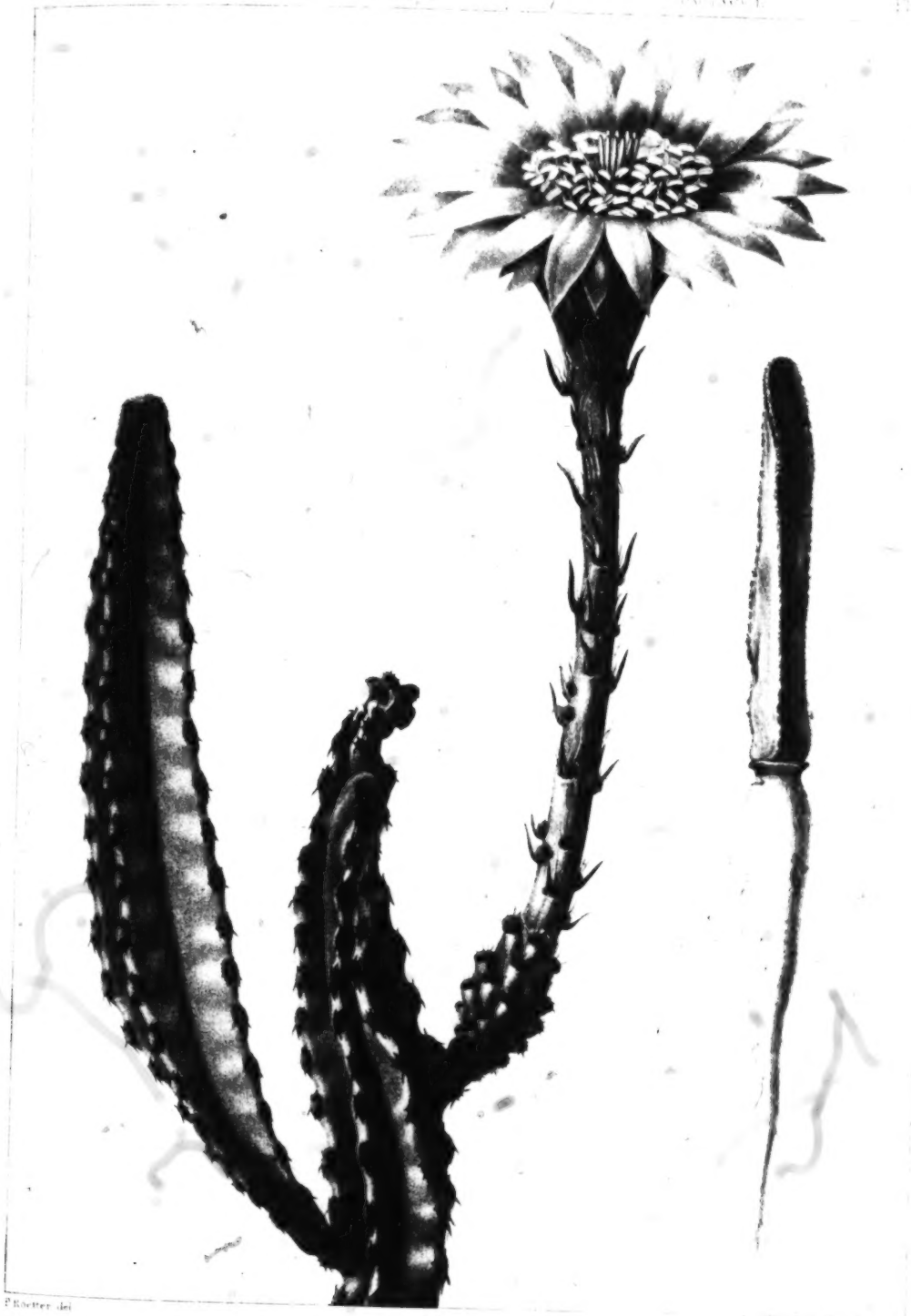
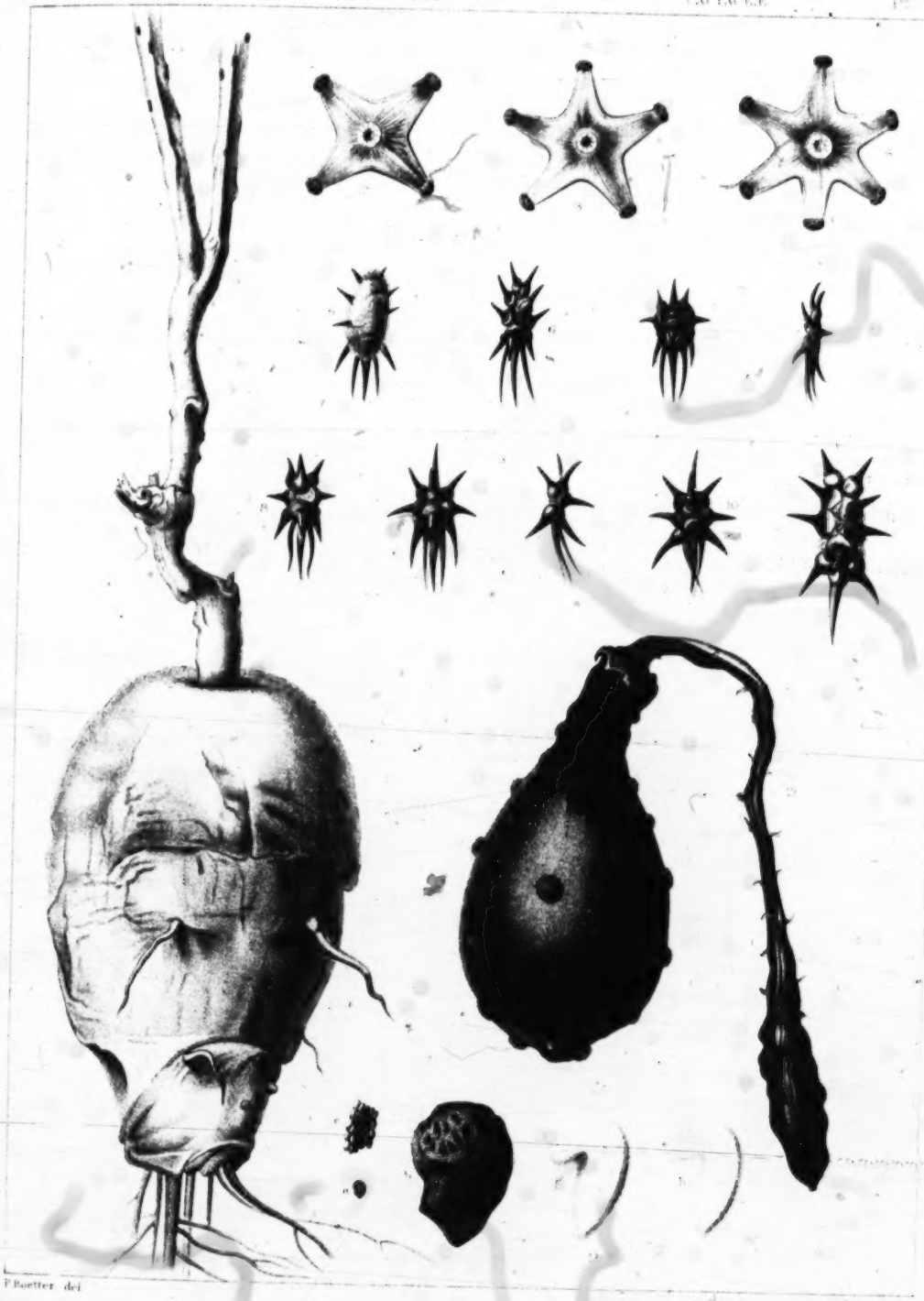


P. Rothery del.

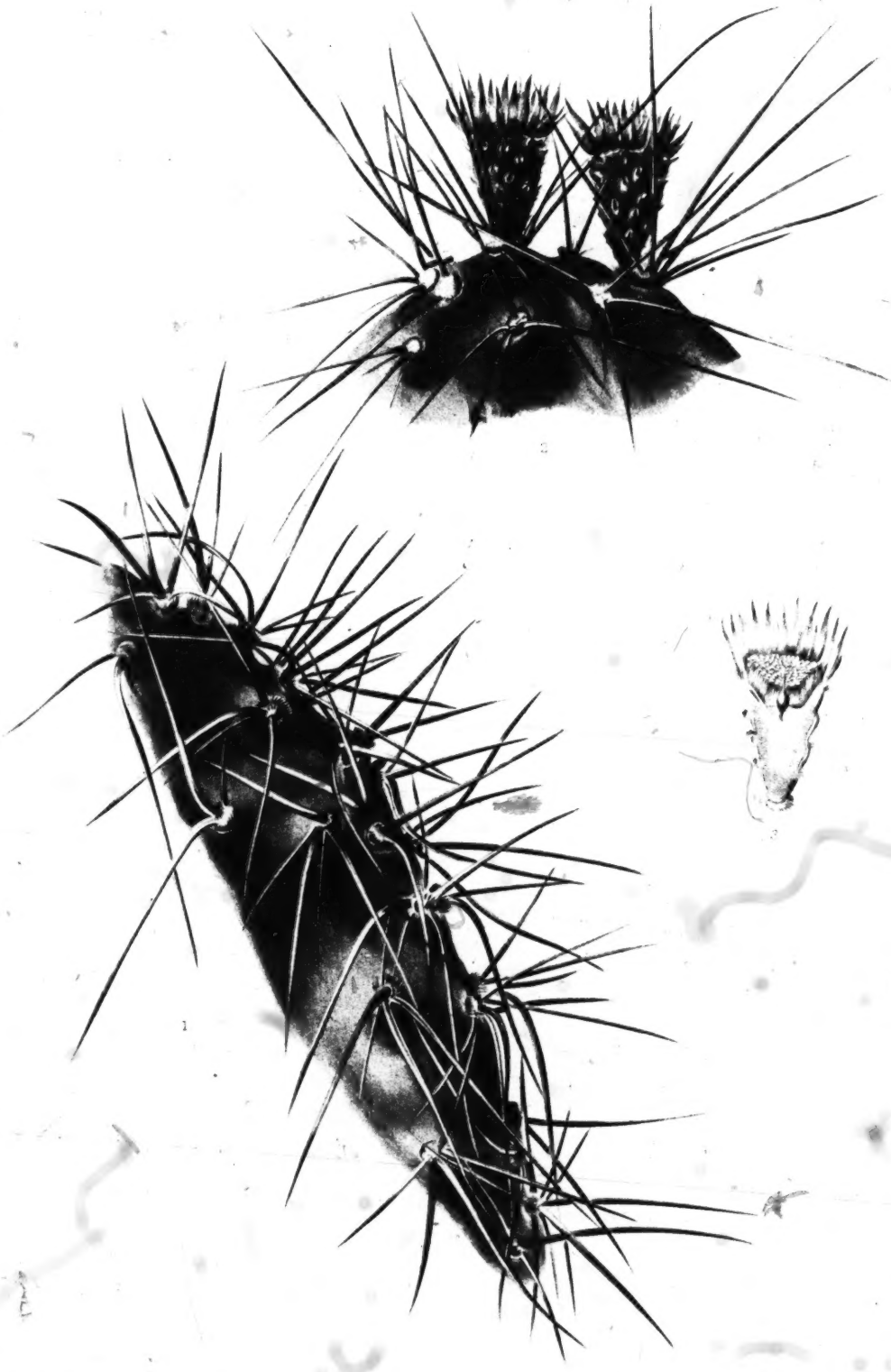
CEREUS GREGGII



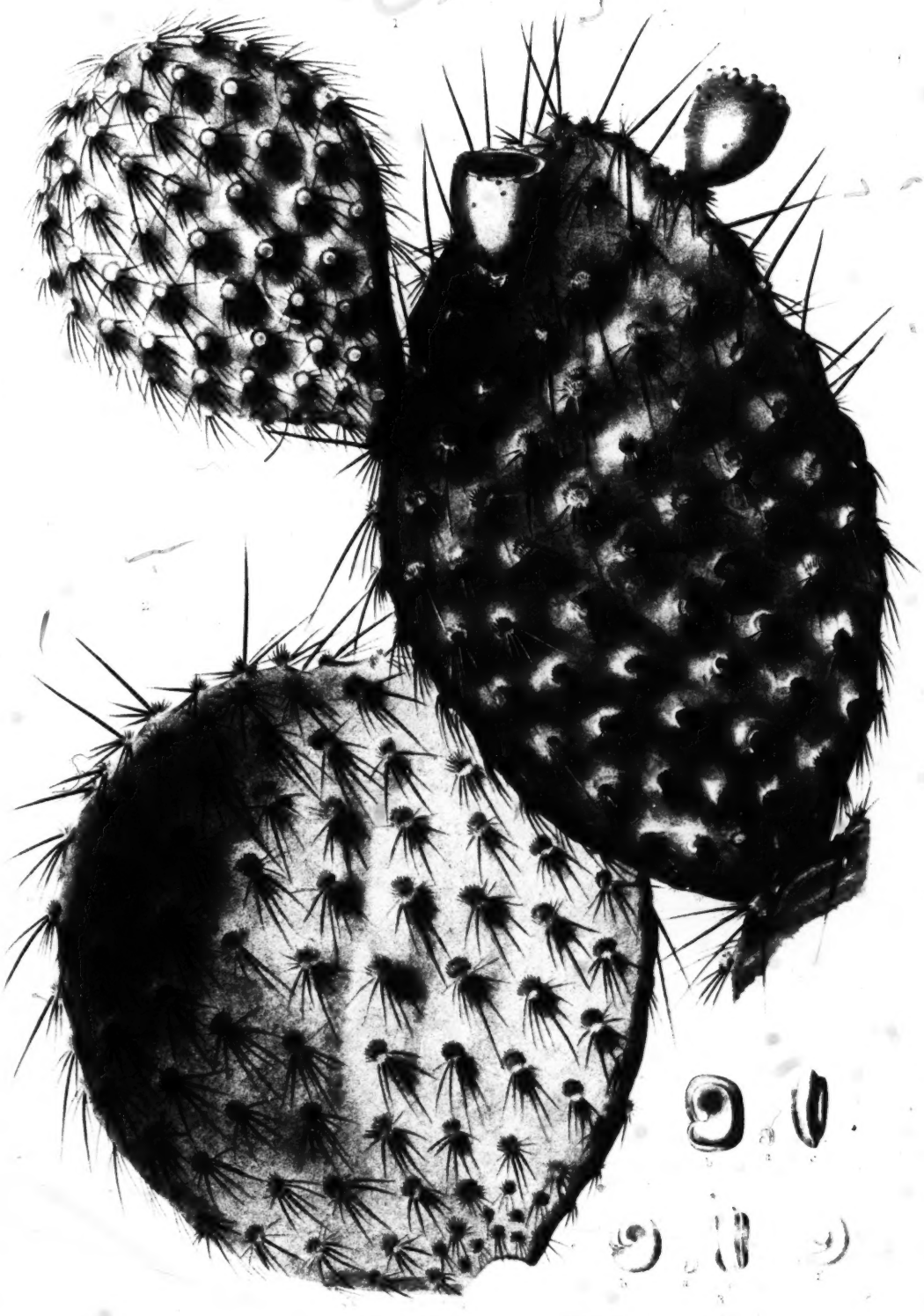
F.Buetter del

CEREUS GREGGII

CEREUS GREGGII β TRANSMONTANUS



OPUNTIA STENOPETALA



F.Roeser del

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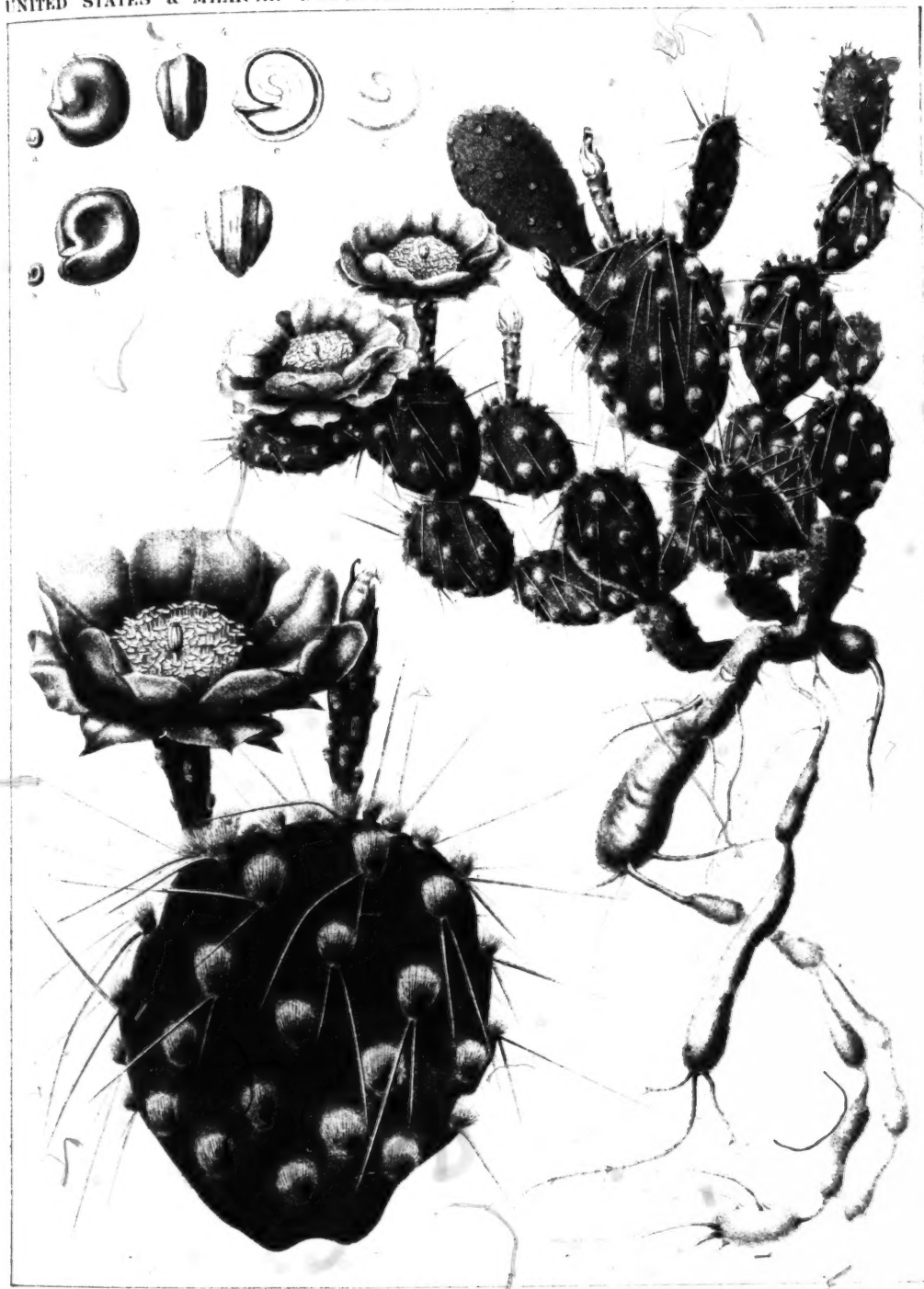
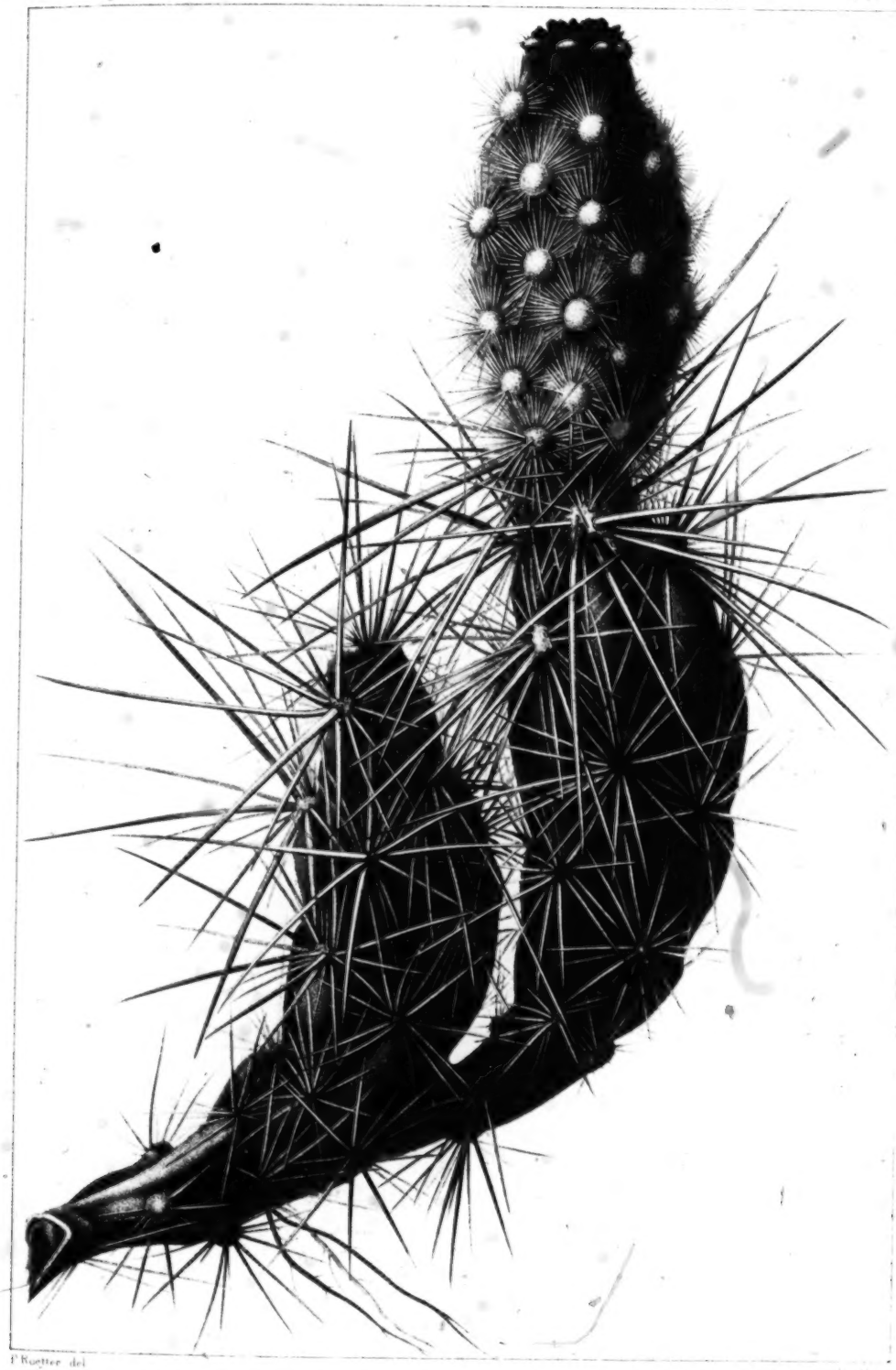


P. Roetter del

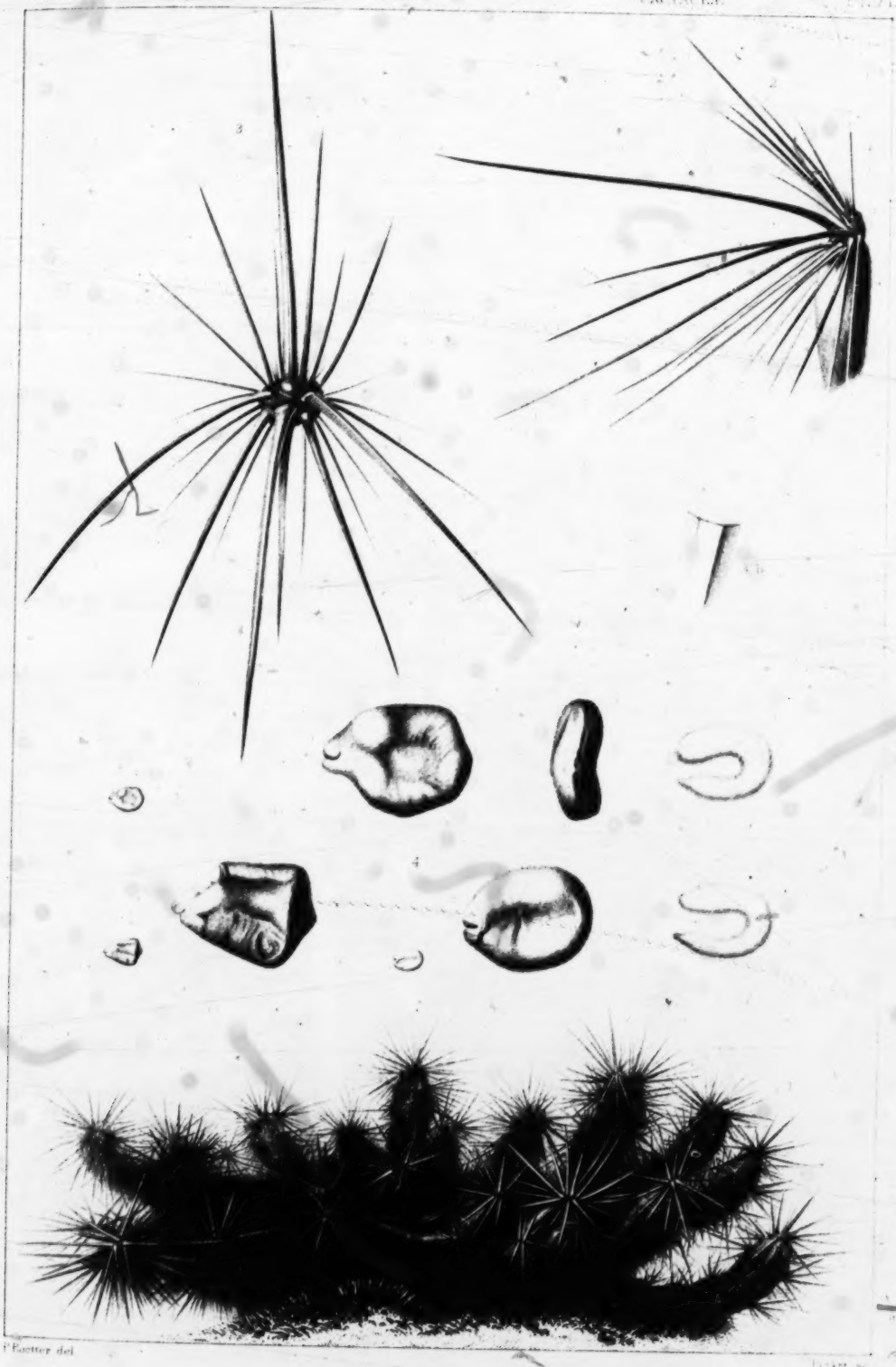
OPUNTIA FILIPENDULA

OPUNTIA MACRORHIZA



F. Kreutter del.

OPUNTIA EMORYI



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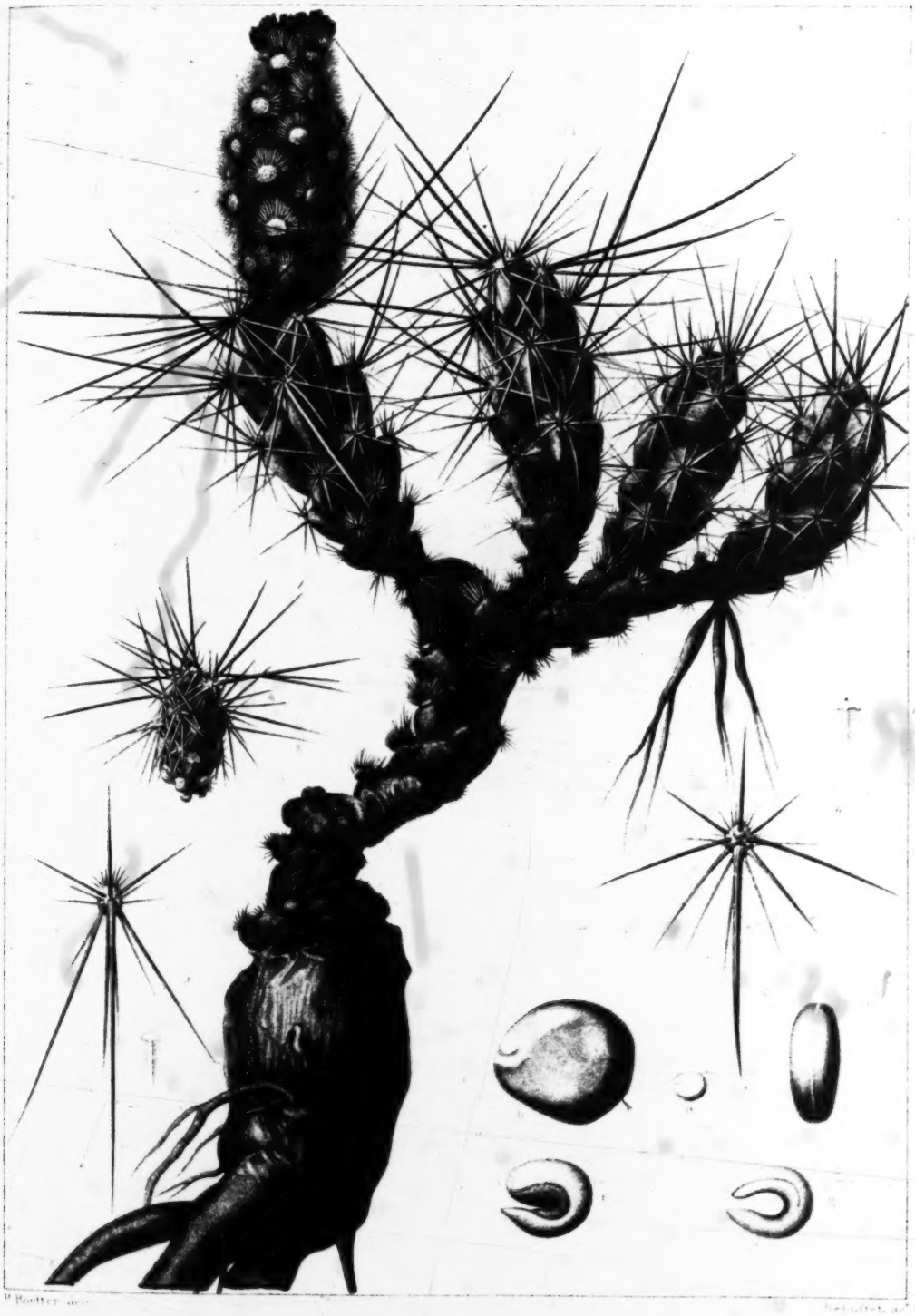
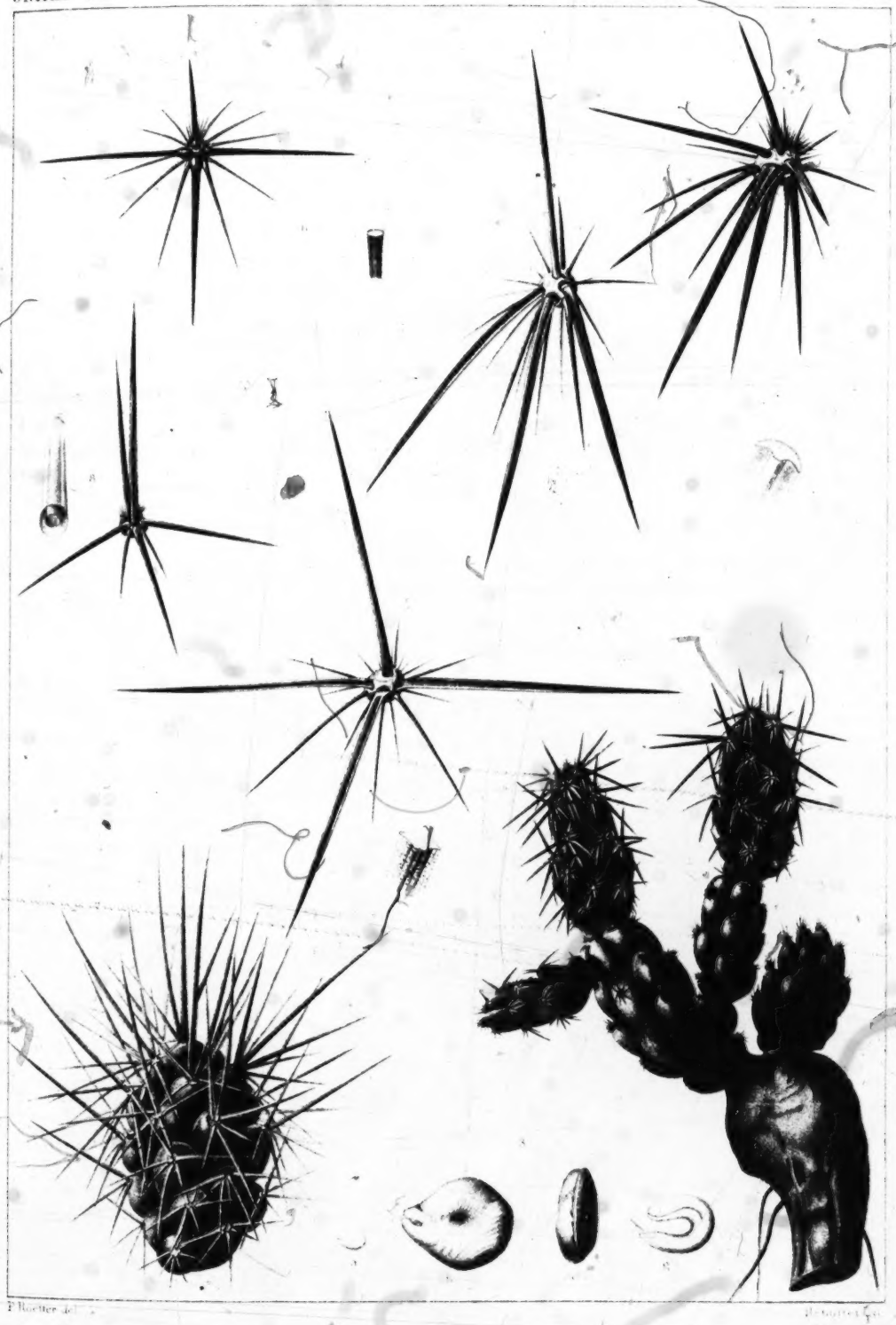
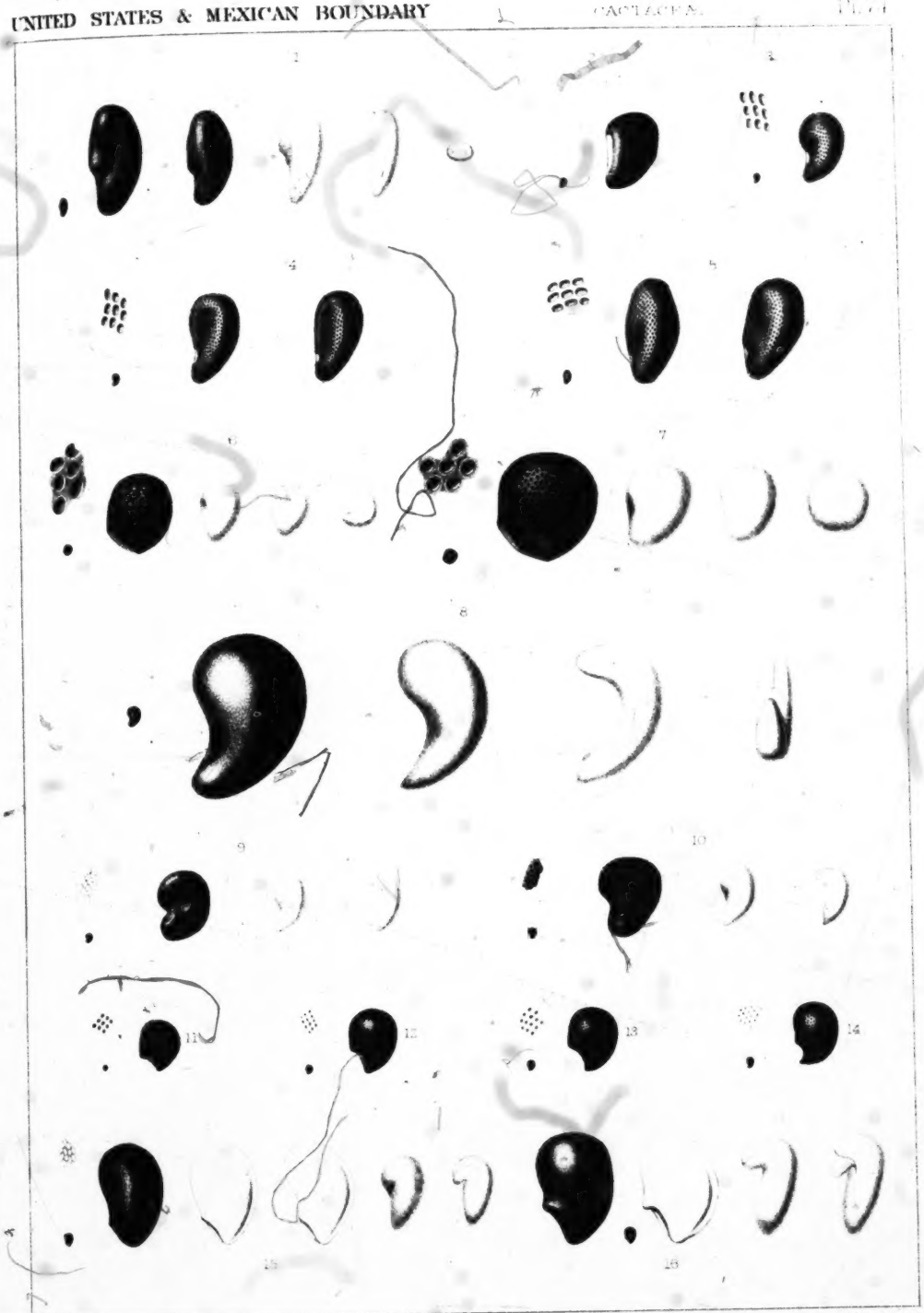


OPUNTIA GRAHAMI



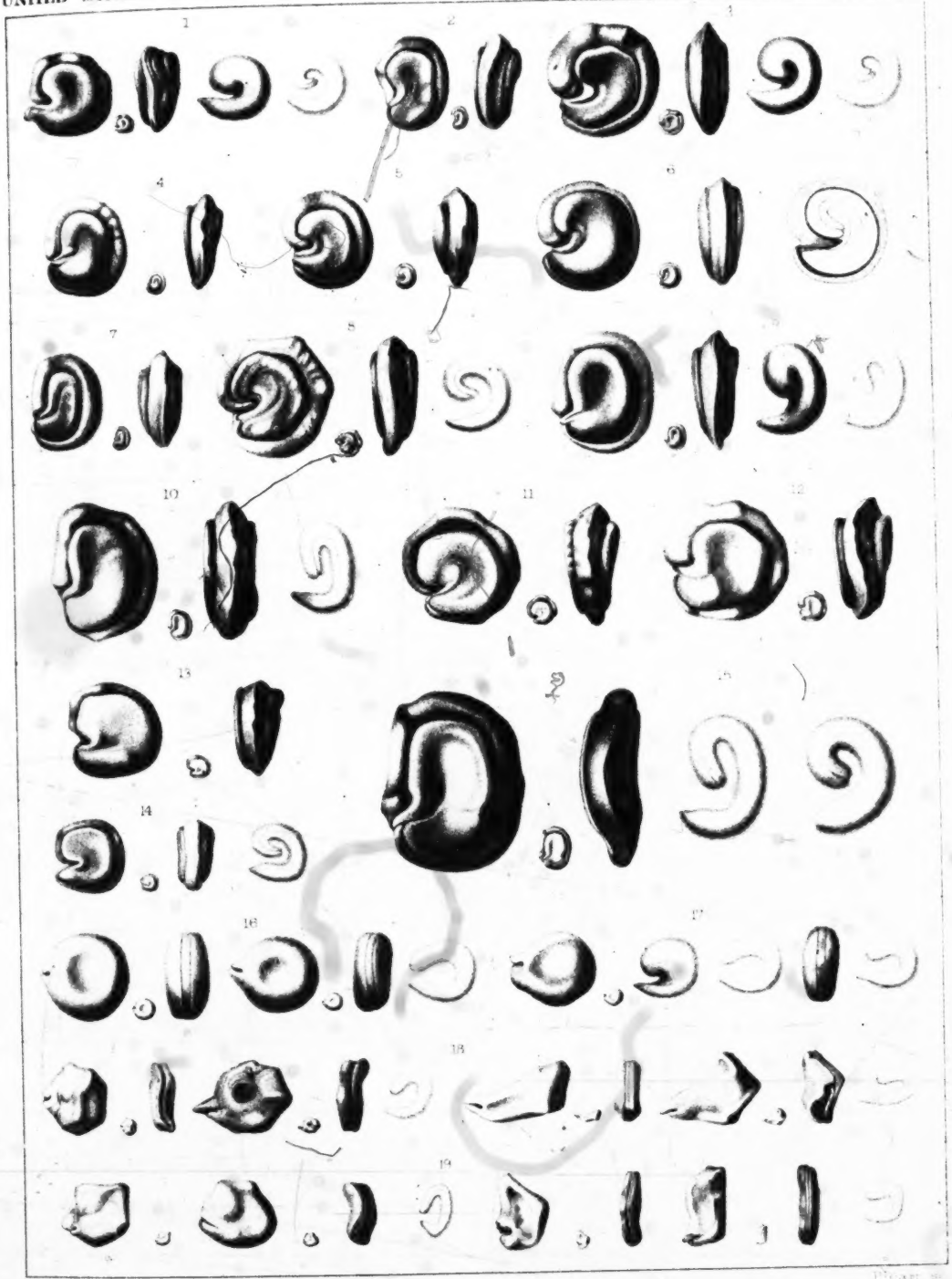
1-3 OPUNTIA SCHOTTII VAR. GREGGII

5-6 O. BULBISPINA 7-8 O. IMBRICATA



A.Boetter del. Ponart Sc.

SEEDS OF MAMILLARIAE, ECHINOCACTI AND CEREI



P. Roetter del. Picart sc.

SEEDS OF OPUNTIAE

PART II.

ZOOLOGY OF THE BOUNDARY.

MAMMALS. . . . . By S. F. Baird.
BIRDS. . . . . By S. F. Baird.
REPTILES. . . . . By S. F. Baird.
FISHES. . . . . By C. Girard, M.D.

WASHINGTON:
1859.

UNITED STATES AND MEXICAN

BOUNDARY SURVEY,

UNDER THE ORDER OF

LIEUT. COL. W. H. EMORY,

MAJOR FIRST CAVALRY, AND UNITED STATES COMMISSIONER.

MAMMALS

OF THE BOUNDARY,

BY

SPENCER F. BAIRD,

ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION.

WITH NOTES BY THE NATURALISTS OF THE SURVEY.

REPORT ON THE MAMMALS.

ORDER

CHEIROPTERA.

Family ISTIOPHORA. Leaf-Nose Bats.

Ch.—Molars cuspidate; nose with a foliaceous or leaf-like appendage, in which the nostrils are situated.

The leaf-nosed bats are easily recognized among the other *Cheiroptera* by the presence of a peculiar appendage to the nose. This, instead of being simple, with two nostrils opening at the end or sides of the muzzle, as in ordinary mammals, is provided with a peculiar appendage of varied form attached to the extremity of the snout, and having the nostrils opening through it. There are four sub-families of the group, which may be characterized as follows:

a. Desmodina.—Molars presenting a longitudinal sharp edge, and of the minimum number, $(\frac{2-2}{3-3})$. Nasal appendix without any upright leaf; the ears separated; a triangular bald spot on the end of the lower lip. Anal membrane short or none; tail wanting.

The species confined to South America.

b. Phyllostomata.—Molars cuspidate; ears separated; nasal leaf lanceolate, erect, (except in *Brachyphyllum*.) Inter-femoral membrane short; deeply excised; tail very short.

Of this group one species, *Choeronycteris mexicana*, is found in Mexico. All the others belong to South America. The assignment of a species, *Brachyphyllum cavernarum*, to South Carolina, as well as the West Indies, has not been substantiated by any American author.

c. Megadermata.—Ears large, united; tragus present.

It is in this group that the species I propose hereafter to describe is found.

d. Rhinolophina.—Ears large, separated; without a tragus.

The species of this group are confined to the Old World.

MACROTUS, Gray.

Macrotus, Gray, Voyage of the Sulphur.

Gen. Ch.—Nasal appendage with the leaf ovate, lanceolate, erect; inter-femoral membrane large; tail long; free at the tip.

It is to the genus *Macrotus* of the sub-family *Megadermata* that the first leaf-nosed bat ever positively known as an inhabitant of the United States belongs. It is true that the *Brachyphyllum cavernarum* of the *Phyllostomata* has been given as occurring in South Carolina, but the statement has never been verified by any of the large corps of excellent naturalists resident in that State, and is probably an error.

1. MACROTUS CALIFORNICA, Baird.—California Leaf-nosed Bat.

Macrotus californica, Baird, Pr. A. N. Sc. 1858.

The ears of this species are very large, scantily haired, ovate and rounded at the tip. Their outer edge extends forward to a little behind and below the eye; the inner anterior edge is partially free; the two ears are connected by a membrane, which takes its rise about one-twentieth of an inch behind the anterior free edge of the ear, and is united to the corresponding strip of membrane of the opposite side, so as to form a kind of roof over the middle of the head, the entrance posterior. The tragus is narrow, lanceolate, naked, one-third the height of the ear. The nasal appendage is short, but rather higher than wide, and extending on the side and beneath the nostrils as a narrow margin. It is coated rather closely with short hairs. The lower jaw is slightly fissured anteriorly, with a small narrow wart on each side the fissure; a groove or furrow extends from the fissure along each side the lower jaw.

The feet are entirely free, the spur about as long; the membrane extending between the spurs is slightly concave, leaving the extremity of the tail free for the last joint, or for about one-sixth its total length.

The general color is a pale brownish grey; darker above than below.

Length to occiput	1.00	Length of tragus	.42
Length to root of tail	2.60	Length of leaf of nose	.30
Length of tail	1.50	Wing from carpal joint	3.00
Length of ears	1.10	Fore arm	2.00

This species closely resembles the *M. waterhousii* of Gray, from the West Indies. It differs, however, in the longer tail and shorter appendage of the nose, as well as in the widely different locality.

2347. Fort Yuma, California. Major G. H. Thomas.

Family GYMNORHINA.

Ch.—Nose simple, without a foliaceous appendage embracing the nostrils; teeth cuspidate.

It is in this family that all the North American bats, with the exceptions above referred to, are found, although they do not embrace many different generic forms. The number of species is quite large, though not well ascertained, over thirty being recorded in the books.

In the great uncertainty attending the true characteristics of North American bats, as described, and the necessity of carefully identifying the species of the eastern States, I have been unwilling to attempt the description of the bats of western America at the present time. I have, accordingly, figured but two species; the one, *Macrotus californicus;* the other, *Vespertilio pallidus*, of Major Leconte; the description of which, taken from this eminent author, I subjoin.

2. VESPERTILIO PALLIDUS, Leconte.—Yellow Bat.

Vespertilio pallidus, Lacoxte, Pr. A. N. Sc. Ph. VII, Dec. 1835, 437.

"Upper Jaw. Incisors 1—1, large, simple. Canines 1—1, a little concave on the outer side, with an internal, basal, rather blunt cusp. False molars 1—1. Molars first and second, as in all the others; the third with four cusps, three of them transverse, the interior one smaller, and one posterior.

"Lower Jaw. Incisors. 4. False molars 2—2, the anterior one smaller, rather interior. First and second molarsas in others the third with three cusps, not transverse, the interior one larger, and transversely deeply emarginate.

"Hair light fawn colored, tipped with darker, beneath paler. Face hairy, dark brown. Nose rounded, emarginate. Ears longer than the head, oval, entire, very pale dusky brown. Orillon nearly one half the length of the ear, linear, blunt. Membrane thin, naked, brown. Inter-femoral, including the tail, except the two last joints.

"Length, 3; tail, 1.5; naked part, 1; extent, 12.1; head, 9; ears, .35; Orillon, 4."

Inhabits California.

"Differs from all the other species in having but four lower incisors; I hesitate, therefore, to arrange it with the Serinoid or Muroid Bats, and place it at the end of those two families."

Numerous specimens of this species were collected by the Boundary Commission in Texas, New Mexico, Sonora, and California. The one described by Major Leconte was taken at El Paso.

ORDER

INSECTIVORA.

3. BLARINA BERLANDIERI, Baird, (p. 53.[1])

Several specimens of this species were contained in the Berlandier collection, and are easily characterized by the above diagnosis. The species is described more at length in the report on the Zoology of the Pacific Railroad Survey.

2159. Matamoras, Mex., Lt. Couch.

4. BLARINA EXILIPES, Baird, (p. 51.)

A single specimen of Shrew, (631,) which I somewhat doubtingly refer to a species described in the report on the Zoology of the Pacific Railroad Survey, as found in Mississippi, was take at Brownsville, Texas, by Capt. Van Vliet.[2]

631. Brownsville.

ORDER

CARNIVORA.

5. FELIS CONCOLOR, Linn. (p. 83.)—American Panther.

1355. Matamoras, Mex., Lt. Couch.—1148. Eagle Pass, Tex., A. Schott.—1005. San Elizario, J. H. Clark.—1110. Copper Mines, N. M., J. H. Clark.

"Panthers are found in greater or less numbers throughout the entire country traversed by the Boundary Commission. In Texas, along all the streams where there are thick bushes, it has been seen from the coast to the Rio Grande, at El Paso del Norte; and likewise from the latter place, in similar localities, was observed by us as far as Los Nogales in Sonora; in which State, the Mexicans, who call it *Leon*, wage against it an unceasing warfare, on account of the ravages which it commits among the cattle. It destroys very many colts and calves in that country, not very often attacking full grown animals. The most effective means used for their destruction, in the hands of the Sonoranians, is strychnine. They poison with this substance the carcases of the animals that have been slain, and not only often succeed in thus killing the *Leones*, but a great number of wolves also.

[1] The page referred to in brackets is that of the General Report on the Mammals of Western North America, forming the eighth volume of the series of Pacific Railroad reports, where the species are described at length, and their synonymy given in detail.

[2] A species of long tailed shrew or true *Sorex*, collected at Fort Bliss, Texas, by Dr. Crawford, was received too late to characterise in this place. A species of *Scalops*, (*S. latimanus*,) is described from Texas, by Dr. Bachman, but it has not fallen under my observation.

"Near Los Nogales, in the month of June, we pursued a female panther, which we succeeded in wounding very severely, the bullet having shattered the hind leg several inches above the ankle. It uttered a kind of howling cry, and fled as rapidly as it could, and disappeared. Six days afterwards we came very suddenly and unexpectedly upon this same animal, lying partly concealed in a fissure among the rocks. Although we were within ten feet of it, when we saw it with its mouth opened, showing its teeth in a very threatening manner, and uttering at the same time a deep growl, it did not offer to spring. As soon as it was killed, we observed the old wound. The weather had been warm and worms were busy in the place where the leg was broken, and the animal had become so emaciated as to lead us to believe that it had remained in that spot during the entire six days, certainly without food, and perhaps without water.

"Those panthers that we have observed were always found in the most solitary places, generally where there were thick bushes, and in the vicinity of rocky spots, affording caverns for secure concealment, and in which to bring forth their young. They always manifested great shyness, and fled rapidly at the sight of us, rendering it difficult to get within gun shot of them.

"On one or two occasions we have heard their cry in the night, when they seemed to be at a distance, but in sight of our camp fires."—(Kennerly.)

"*Felis concolor;* Cuguar or Panther, of the Texans; Leon, of the Mexicans; Chimbica, of the Cochimies of Lower California, Yutin, of the Apaches; Mixtli, of the ancient Mexicans; Pagi, of the Chilefios; Puma, of the Peruvians.

"A remarkable fact in respect to the panther is related by Clavigero, in his history of Lower California.—(See Book I, chapter 16.) According to this author, the puma exercised so severe a rule over that unhappy peninsula that the work of civilization, commenced by missionary Jesuits, never could rise above a certain elementary state. The missions and presidios established there, after years and years of labor, could never succeed in raising their own supply of domestic animals, but had to depend for that on the States of Sinaloa, Sonora, and other parts of the Mexican empire.

"The prodigious spreading of the 'Puma' over the peninsula of California seems to have been caused by a superstitious belief on the part of the natives there, who did not dare to kill or disturb this animal in any way. It became one of the missionary labors to gradually overcome and remove this singular notion. Indeed, the state of civilization among the California Indians has been so low that they in some respects depended on the success of the sporting puma. Thus Clavigero states that the hungry Indians used to watch the gathering of the buzzards, and searched the ground carefully whenever they observed a number of these scavenger birds, the acute scent of which leads them always unfailingly to the spot where some carcass was deposited upon or under ground. By these means these miserable savages were enabled to discover the remains of a puma feast, which such a lordly beast, after the fashion of all the 'Felidae or Canidae' had hidden away here, and slightly covered with soil.

"In the regions of the Rio Bravo del Norte, and other sections along the boundary line, the puma acts a less prominent part. Here he is eagerly hunted by the white and red man, and especially by the cattle-raising sons of the half breed Mexicans.

"The numerous herds of wild cattle, mustang, mules, and horses, besides plentiful other game in the fertile valleys and table lands of the Lower Rio Bravo, Nueces, and other Texan rivers, form a rich support for a vast number of pumas and jaguars.

"The habits of the puma seem to be nocturnal, and it is during the hours after dark that his mournful note is heard resounding through the solitude of the deserts. The note listened to once attentively is apt to make a deep lasting impression.

"The different native names as pronounced in Spanish sound very appropriately to the note, and it is likely that the cry of the animal forms the base of its names. The note itself is often several times repeated, with intervals of from two to four minutes. As night time advances, the cry is heard but rarely.

"A puma was killed on the Rio Bravo, between Fort Duncan and Laredo. It was full grown and of considerable size, measuring from the nose to the insertion of the tail nearly four feet. This one was the head of a family, consisting of himself, a mother and two young ones. During his struggle with the hunters and dogs he raised a terrible cry, twice or thrice, to express his rage, and perhaps also to give to his family the notice of danger. The latter seemed to have retreated immediately after hearing the warning, as the hunters, after despatching the old one, could trace the fresh tracks of both the mother and the two young going down on the river side."—(A. Schott.)

FELIS ONZA, Linn. (p. 86.)—Jaguar; American Tiger.

This huge cat replaces on the continent of America the tiger of the Old World, as regards size and strength; little inferior to it in these respects, it is, however, less dreaded by hunters.

The specimens at present before me do not permit any very accurate description of the species, except as to its color. One of these is from the Brazos river, Texas; the other from Brazil. In the former, the ground color of back and sides is of a pale golden yellow, of the belly white. The top and sides of the head, neck, and shoulders, the legs all round, and the belly,

are marked with full black blotches, smaller on the top of the head, sides of neck and shoulders; larger on the outside of the legs; largest on the belly and inside of legs. The top of the muzzle is unspotted brownish yellow. Just back of the shoulders on the dorsal line are one or two large blotches, with central light spaces; beyond this, and extending to the tail, is a vertebral series of elongated blotches, more or less confluent, and in contact, and with little or no trace of lighter centres. On each side of this line, the sides of the body are seen to be occupied by several series of large angulated blotches; the exterior black, and more or less interrupted, inclosing an area of the ground color, with from one to four spots of black. No difference of color between the centres of these blotches and the intervals between adjacent ones is discernible, as in the ocelot. There may be traced from three to five series of these blotches on each side of the vertebral line, and they may be made out to occupy the meshes of an irregular reticulation of ground color, and are sometimes alternate, sometimes opposite. The tail is marked with elongated blotches on a yellow ground; towards the tip, however, it assumes the appearance of being black, with transverse light bars. The convexity of the ear is black, with a white blotch.

The Brazilian specimen is much the same with that above described, except that it is considerably larger, and with more red in the ground color.

This species differs in the pattern of coloration from the ocelot, in being without the lines or stripes on the head, upper surface of neck and limbs, these portions being provided with small simple blotches, occasionally elongated. The anterior half of the tail is irregularly blotched, the posterior half only being like the entire tail of the ocelot, black when viewed from above, with transverse light bands. The sets of spots are more regular and distinct, and less elongated than in the ocelot; the intervals between the sets of blotches are of the same color with the centres of the latter, instead of being lighter.

This species is found through the greater part of eastern Texas, extending as far as Red river. It is quite probable that specimens have been killed within the limits of Louisiana, as at present constituted. Southward it ranges through Brazil (where it is abundant) and Paraguay as far south as the Rio Negro.

"This large cat, so common in southwestern Texas, especially along the lower Rio Grande, is rarely seen so far north as El Paso del Norte. The only individual observed by our party west of the latter place was seen in the Sierra Madre, near the Guadaloupe cañon. However, we were assured by many persons of Santa Cruz that it was very common near that village, in the valley of the river of the same name."—(Kennerly.)

Jaguar, tiger, leopard of the Texans; tutinquillé, of the Apaches; tigre, of the Mexicans.

This powerful rival of the puma equals the latter in size and muscular strength and elasticity in the use of its limbs. The habits of both coincide almost entirely, perhaps with the exception that the jaguar confines itself rather to more covered regions, preferring the impenetrable thickets in the river bottoms. Here he lies in wait for his prey, especially on the watering places of mustangs, wild cattle, and deer. Its less extensive geographical distribution, however, gives the jaguar a minor importance when compared with the puma.

As far as my knowledge extends, the head of the Rio Bravo, with the surrounding country, is the northern limit of the jaguar. The westernmost specimen of the genus was seen in the Guadaloupe cañon (Sierra Madre) by Mr. J. Weyss, one of the assistants of this commission.

Many stories about the ferocity of this animal are told among the inhabitants of the western regions, but none substantiating the fact that a jaguar unprovoked will attack man. In the annals of the convent of San Francisco, in Santa Fé, a bloody occurrence is recorded which contains some indications of the jaguar's nature.

The following is an abridged translation from the Spanish:

"On April 10, 1825, a lay brother, after having made confession and concluded his prayers, entered the sacristy. There he was terror-stricken on opening the door and seeing himself almost face to face with a jaguar (tigre) of very extraordinary size.

In a moment the poor man was in the clutches of the beast, which dragged its victim into a back corner to finish the bloody work. The guardian of the convent, on hearing the exclamations in the sacristy, hurried to enter the fatal room, and had scarcely become aware of what had happened when the animal leaped upon his second victim and despatched him with the same promptitude as the first. After a while several other men attempted to enter the bloody sacristy, but not without meeting a similar fate, for the first one opening the door was immediately slain. A senator, Mr. Iriondo, being present, tried now to approach the sacristy by an adjoining back room which communicated with the former by a small door. The jaguar, however, had left the sacristy in the meantime through that very door which Mr. I. wanted to use, and before the latter, followed by a small crowd, could enter it, he heard the cries, "here he is! here he goes! save me!" With this the roaring of the jaguar was heard, and mingled with it the last exclamations of a fourth victim. Each party now retired, the convent people to the church, and the jaguar to where he had chosen his first stronghold.

"Mr. I. now approached and bolted the door of the sacristy opening into the church, making the least noise he could. A hole was then bored through the door, and finally the crowd succeeded in shooting and killing the dreadful monster through the opening thus prepared."

Some explanation is necessary to make more intelligible this almost incredible occurrence. The convent of San Francisco, in Santa Fé, is situated upon the banks of the Rio Bravo, which, after freshets, occasionally overflows the islands in front of the town. During one of these overflows all the animals living in the thickets upon the island seem to have been driven out; among them the above jaguar, which made for the town side, where he entered the gardens of the convent. A low wall only encircles the latter towards the river. From the gardens he entered a small door, accidentally left open, and so came through an old back vestry to the sacristy. At the time his first unfortunate victim entered the sanctuary from the church side the animal was perfectly aware that his retreat was cut off by the river flood, and thus found himself forced to the desperate attack upon a man, which he was likewise compelled to repeat several times.

The largest jaguar skin which I saw was taken from a specimen killed near the mouth of the little stream Las Moras, above Eagle Pass, and measured nearly five feet to the insertion of the tail.

7. FELIS PARDALIS, Linn. (p. 87.)—Ocelot: Tiger Cat.

Sp. Ch.— Size about that of the American wildcat. Tail not half as long as the body and neck (exclusive of the head.) Ears black, with a white spot. Tail above black, with narrow bands of white; five stripes on the back of neck, with lighter intervals; a dorsal series of full black blotches, sometimes more or less continuous; the rest of back and sides showing a grayish network inclosing angular blotches more or less elongated, black externally, brownish yellow in the centre; those blotches next the dorsal line more serial and smaller.

In size this animal about equals the Texan lynx, weighing rather more than the common *Lynx rufus*. The skull is decidedly longer, its general form not dissimilar to that of the common cat. The fur is short, close, and glossy. The legs are rather long. The ears are large, rounded at the apex, nearly naked aronnd the meatus, around and anterior to which are numerous bristly hairs. The convexity of the ear is covered by a short velvety fur. The whiskers are in four principal horizontal series, the lower ones white, the upper brown. There are naked pads under all the four toes of the four feet, with a larger central one on the under surface of the latter, or five to each foot. On the fore feet there are two additional naked spots above the palmar pad. The tail is nearly cylindrical, tapering slightly to the end, which, however, is blunt; it is covered uniformly all around with hair. In the prepared specimens the tail is less than half the length of head and body together (about two-fifths.)

The general character of the ground color is a dull brownish yellow mixed with dusky; in some specimens there is a more grayish tinge. On this ground is a series of blotches and ocelli of black, sometimes more or less rounded, sometimes much elongated; on the side the spots are included in the meshes of an elongated reticulation of gray; beneath, the color is white, with larger full blotches of black, faint on the lower belly. The legs are spotted all round with full blotches of black, which, on the inside of the fore legs, assume the character of transverse bars. The tail, viewed from above, appears to be black, with six or eight transverse bars o

grayish white; these, however, are generally blotches on the upper surface, which sometimes pass around as annuli to the lower surface, and are there interrupted by a narrow break; sometimes they are alternated beneath by other blotches.

The precise pattern of coloration on the body and head is difficult of expression, and varies somewhat with the specimen. The edges of the orbit and the anterior canthus are dusky; the eyelids again and a spot above the anterior canthus are yellowish white. The insertion of the whiskers is shown by four horizontal series of black dots. There is a narrow black stripe, commencing below and parallel with the lower eyelid, and converging posteriorly a little towards another starting from the posterior canthus of the eye. There are several blotches on the side of the neck below the ear, and a row of the same passes across the throat below the occiput, sometimes forming a complete gorget. Starting a little above the eye is a quite distinct black stripe, (those of opposite sides nearly parallel,) and passing to the occiput inside of the ear; between these, on the forehead, are four or five linear series of blotches more or less continuous; the upper part of the muzzle, however, is uniform brownish yellow. The ears are black on their convexity, with a white spot near the posterior margin; the hairs on the concavity of the ear are of a dirty white. On each side of the neck above is a curved black stripe, the convexity downwards; between these are three others nearly straight and parallel, one of them median. They all have the central line (or about one-third) of the light yellowish ground color. On the sides of the neck are a few elongated full blotches, and beneath some few rounded ones in the white ground.

There is a vertebral series of rather angular, elongated full spots of black, which are sometimes continuous for a space, then interrupted. On each side of this may be traced pretty distinctly a series of angular blotches, the centres of the much lighter ground color, and on the sides exterior to these are still larger and more irregularly disposed ocellated blotches, with a greater amount of paler centrally, the black border sometimes not continuous, and occasionally with small full spots of black on the central ground. The intervals between these areolated blotches are lighter and purer than the centres of the blotches themselves; indeed, in one specimen, there is a quite distinct and pretty regular reticulation of grey, with the meshes occupied by the blotches described, namely, an exterior of black enclosing an area of dusky brownish yellow, with an occasional black blotch. On the shoulders are several oblique black lines, and sometimes there are transverse lines of the same on the exterior of the arm.

Measurements.

Point of nose to root of tail, 27 inches; tail to end of vertebrae, 10.50; tail to end of hairs, 11.00; ear above skull, 1.50.

The largest skull I have seen (1358) is 5.30 inches long and 3.46 inches wide.

This species is readily distinguished by its smaller size from the jaguar, the only other spotted cat with long tail inhabiting the United States. There are, however, several species of nearly the same size in South America, to which it approaches more or less. *Felis macrura* or *oceloides*, with somewhat similar markings, is of considerably less size, (not larger than a house cat,) and has a tail as long as the body, (exclusive of the head,) instead of being not half this length. This species occurs in Brazil, where it is very common. The *Felis tigrina* of the Amazon is also a much smaller animal, with about the same length of tail, and the markings resembling

more those of the jaguar. *Felis mitis*, so abundant in Southern and Central Brazil, comes much closer to it than any, and is distinguished with some difficulty; it is, however, a smaller animal, lower on the legs, not so much blotched beneath, and the spots on the sides separated by longer intervals and scarcely arranged in series.

Whether or not the present species should bear the restricted name of *Felis pardalis* can only be ascertained from an examination of a large number of South American specimens. Several names of supposed distinct species—as *F. catenata*, Griff.; *F. armillata*, Cuv.; *F. chibiguzu*, *F. griffithii*, Griff., &c.—are usually considered as mere varieties of one.

The skull of the ocelot in general shape is not dissimilar to that of the panther or cougar (*Felis concolor*;) it lacks, however, the depression of the skull at the posterior extremity of the nasal bones, nor are there any traces of the dove-tailed wedges sent up from the parietal bones into the frontal. The post-orbital processes are longer, the sides more nearly parallel, and the sides more perpendicular to the major axis of the skull. The upper outlines of the skull are quite similar. The incisive foramina of the ocelot are larger and longer, extending as far as the anterior edge of the canines. The upper canines of the ocelot are more compressed than in the cougar, and have four distinct longitudinal grooves externally. There is but little difference in the shape of the other teeth; the second premolar is perhaps shorter and higher in the cougar. The deciduous dentition is also very similar; the most anterior of the two forward tubercles of the second molar longer perhaps in the ocelot. The coronoid process of the lower jaw is higher, narrower, and with less concave outlines behind in the ocelot. There are also but two distinct foramina on the outside of the jaw below the vacant space separating the canine from molars, and these are in a horizontal line, and sometimes confluent in one, while in the panther there is a third one, equally distinct, above the anterior one of the horizontal series.

29. Eagle Pass, Texas. Col. S. Cooper.—129. Eagle Pass. A. Schott.—255. Matamoras. Lt. Couch.

Tiger cat, Leopard cat of the Texans.—"This beautiful cat, though quite common through the western wilds, was met by our party but once on the lower Rio Bravo. The dogs started it first and 'treed it,' as the hunters say. One or two pistol bullets, however, drove it down again, to seek a safer place in a dense nopal thicket, a common resort of persecuted animals.

"In taking off the skin of this specimen I found its inside all over covered with opuntia prickles, which, naturally barbed as they are, had worked themselves in with the movements of the skin. The animal, however, did not seem to have suffered any, by this otherwise dreaded annoyance, for all the prickles lodged themselves horizontally or in an oblique direction into the skin, so that the points would not reach the muscles and nerves. I observed subsequently the same circumstance on other animals, which accounts for the readiness with which they take to these bushes, unapproachable for men.

"As the ocelot is but a small robber, his importance in regard to the development of civilization stands in a strict proportion to the size of the game he is preying on. He is, however, eagerly hunted for the sake of his beautiful fur.

"Almost every western trapper, of both the white or red race, has something of his professional outfit adorned or made of an ocelot's sk

"One or two dollars are paid for one, and this is also about the price of a Jaguar or Puma skin."—A. Schott.

8. FELIS EYRA, Desm. (p. 88.)—Tiger Cat.

Sp. Ch.—Size of the house cat, but neck longer, and general form more musteline. Tail rather longer than the body, exclusive of the neck and head. Color uniform brownish red, a little paler beneath. (Hairs not mottled?)

The introduction of this species into the fauna of North America is based upon a skull in the Berlandiere collection, together with a short description and figure by Dr. Berlandiere. Although not entirely certain that it is the true *F. eyra*, or that the *F. unicolor* of Traill is the same animal, yet, in the absence of fuller data, it will be safe to consider it for the present as

the *eyra*. According to Dr. Berlandiere the animal is "entirely rufous, the head small, ears short, without tufts, body long and slender, tail long. Size of common cat, but longer. Inhabits the desert regions of Tamaulipas, where it is called *onza* and *apache*." He further adds that it is found in the shrubbery along the Rio Grande, near Matamoras, although very rare. The specimen described, to which the skull (1373) probably belongs, was a female, taken very young and kept in captivity a good while without ever becoming entirely tamed.

The figure of Dr. Berlandiere represents the animal as a uniform light reddish brown, without any spots whatever, and no lightening of tints beneath. The ears are rather pointed. The tail is slender and tapering gently to the tip, which is not tufted. The tail is rather longer than the body, by about half the length of the neck. The figure also represents the pupil as vertical; other authors describe the pupil of *F. eyra* as round.

The whole form of the animal is very musteline, as shown both by the skull and the figure. The skull is about as long as that of the common cat (the brain case rather more capacious), but is more elongated and narrower between the zygomata. The neck also is very long.

According to Burmeister the *Felis eyra* is of a clear yellowish red, paler on the belly, the upper lip white, the iris greyish yellow brown, the pupil round. The head and body measure one and a half feet, the head alone three inches, the tail one foot; height anteriorly ten inches, posteriorly one foot. It occurs throughout Guiana, Brazil, and Paraguay, and by the present identification, as far north as the Rio Grande of Texas.

	Felis eyra.	Large house cat.
Length of skull (1373)	3.55 inches.	3.55 inches.
Width of skull	2.33 "	2.61 "

The skull of *Felis eyra* is about as long as that of the domestic cat, but considerably narrower and more musteline in appearance. The muzzle is narrower, and the zygoma extends further forwards, so that its anterior extremity falls a little in advance of the second premolar instead of within it, as in the cat and ocelot, and still more in the panther. The free portion of the zygoma anteriorly is narrower than in the cat, and the ante-orbital foramen is double in the specimen instead of single. The flattened portion of the crown is of considerable extent, and reaches to the middle of the nasals, instead, as in the other cats, of involving only the posterior extremities of these nasals. The top of the muzzle is broader, and the sides are much less pinched in and more vertical. Viewed from above the zygomata are nearly straight in lateral outline, the lines converging so as to intersect in front of the incisors at a distance of about two-thirds the length of the skull. The post-orbital process of the frontal and malar (the two almost meeting) are much more anterior in this species than in the house cat. The auditory bullae are more compressed. The occipital foramen, instead of being angular above, is gently curved, the whole representing a regular ellipse, the rather larger diameter transverse. The occipital condyles are larger and more acutely convergent. The occipital outline is less triangular, more pentagonal.

The rami of the lower jaw are narrower than in the house cat; the coronoid process, on the contrary, is higher, broader, and straighter behind.

The outer incisors are larger than in the house cat, the interval between the upper incisors and canines less. The third upper premolar is larger than in the house cat; the central and

anterior lobe occupying a rather larger proportion of the tooth; the horizontal section of the tooth is a right angled triangle, the right angle internal, while in the cat it is external. The inner anterior tubercle, so prominent in the house cat, is here almost entirely wanting, resembling the panther more than the ocelot or cat.

The following notice of the present species is taken from Dr. Berlandiere's manuscript:

"This animal, by some called *onza*, by others *apache*, is extremely rare in Mexico, where I have only seen it in the interior States of the east. In the State of Tamaulipas it is found in the shrubbery which grows on the shores of the Rio Grande del Norte. The specimen which I have described is a female, and was given to me when very young. I tamed it, without its losing altogether the habits of its kind, especially when in sight of some prey. It had attained the size of a cat, but was more elongated and slender. In every movement it exhibited great lightness and activity, of which we had many proofs. This digitigrade was in the habit of purring like a cat."

9. FELIS YAGUARUNDI, Desm. (p. 88.)

Sp. Ch.—Larger than the largest common cat; much more elongated in its proportions. Tail as long as the body, exclusive of neck and head. Prevailing color a continuous grizzled brownish grey, without any spots. Hairs annulated, and tipped with black. Young rather more rufous.

The existence of this species on the Rio Grande, like the *F. eyra*, is established by a skull (1426) in the collection of Dr. Berlandiere, and a description in his MSS. as *Felis cacomitli*. According to him, "the animal was common in Mexico before the conquest, but is now rare; it is somewhat abundant about Victoria, and a few have been killed on the Rio Grande near Matamoras. Its general tint is greyish, but the hairs, considered singly, are annulated with rufous and black, the tips blackish. It is about the size of the *Felis pardalis*, or ocelot. The female, killed in December, had milk in her teats."

Dr. Berlandiere speaks of this animal as being as large as the ocelot. In judging from the skull, however, it is not much more than half as large, and about one-third larger than the Berlandiere skull of *Felis eyra*. According to Burmeister, the *yaguarundi* is a little larger than the *F. eyra;* of a continuous blackish brown grey; each hair has light ash grey at the base, annulated, and broadly tipped with black. The lips and paws are lighter, the greyish predominating; the whiskers are brown. The iris is brown, but lighter than the fur; the pupil round. Dimensions as *F. eyra*, but the head longer, (3½ inches.)

Skull.—The skull of the *Felis yaguarundi*, in general shape, exhibits a close relationship to that of *F. eyra*, and, like it, much narrower and elongated than in the *Felis concolor* or *pardalis;* calling to mind the mustelas as much as the cats. Like the *eyra*, the top of the head is quite plane and broad; the upper outline curves rapidly from the occiput to above the glenoid cavity; it then slopes downwards almost straight, or slightly concave, to above where the orbital process of the frontal bone begins to spring anteriorly; then making a distinct but very obtuse angle, sometimes in a straight line to the anterior extremity of the nasal processes of the frontal, then makes another angle and slopes rapidly downwards, still in nearly a straight line, to the end of the nasals. The chief peculiarity of the species is seen in the projection forwards of the upper part of the muzzle, so that a line dropped from the extremity of the nasals perpendicular to the plane of the palate would fall very nearly in the centres of the incisors. A similar line in the ocelot, or domestic cat, would fall within the canines. The posterior edge of the intermaxillary, or its suture with the maxillary, is in nearly a straight line, at a right angle, or even more, with the

plane of the palate. The sides of the muzzle above, also, are elevated, compressed, and deeply concave, as if squeezed, when soft, between the finger and thumb. The posterior portions of the nasal bones are rather short, and broader than in the ocelot; there is a very decided longitudinal depression in the forehead along the insertion of the nasals between the frontals, as in the cougar. The post-orbital processes are long, and extend perpendicularly outwards and downwards at a more acute angle than in the ocelot. The plane of the zygoma, anteriorly, is more vertical than in the ocelot. The lower jaw is rather short and broad; the coronoid process low and broad, much less attenuated and curved backward than in the ocelot and cat, and broader and less angular than in the *F. eyra*. The skull differs further from that of the *eyra* in the narrower nasal bones, the muzzle projecting more above, and more deeply indented on the sides, and narrower.

The teeth differ from the ocelot, cat, and cougar in the same features as do those of the *F. eyra;* the third upper premolar or sectorial tooth is weaker, and its anterior inner tubercle is nearly obsolete, the tooth sloping rapidly over the fang. The inner angle of the triangle formed by the horizontal section of this tooth is the rectangle instead of the outer, as in the ocelot. Only one groove is visible on the exterior surface of the canines.

Length of skull, (1426,) 3.92 inches; width, 2.49 inches.

This species, according to authors, is found from Paraguay to Mexico, a specimen from the latter country being given by Wagner, as in the Wurzburg Museum. It varies in size, according to different authors, measuring from 22 to 30 inches in the body, (and neck 3,) and from 13 to 24 inches in the tail. The tail is thus about as long as the body, exclusive of the neck.

From the skull, it would appear that the general form, like that of the *F. eyra*, is more musteline than that of the other American cats.

The largest specimens come from Surinam, and it is not impossible that close comparisons may show the existence of two species.

For the introduction of this species, as well as many others, into the fauna of N. America, science is indebted to the liberality and zeal of Lieut. D. N. Couch, of the U. S. army, in purchasing the entire collections of Dr. Berlandiere, and presenting them to the Smithsonian Institution.

"A kind of cat, or at least digitigrade, common in Mexico before the conquest, but at present very rare.

"It is grey, but the hairs considered separately are tinged with rufous and black; their extremities blackish.

"I have been assured that it is killed sometimes in the vicinity of the city of Victoria, the capital of the State of Tamaulipas, and on the plateau of Mexico. On the borders of the Rio Bravo del Norte it is killed in the vicinity of Matamoras. I believe it is not found in Texas."—(Berlandiere.)

10. LYNX RUFUS, Raf. (p. 90.)—American Wild Cat.

This species is abundant in the northern part of Texas, but it is not yet ascertained how far south its range extends.

11. LYNX RUFUS, var. MACULATUS, (p. 93.)—Texas Wild Cat. Called *Gato montis ravin* by the Mexicans.

123. Eagle Pass, Texas. April, 1852. A. Schott.—132. El Paso, Texas. C. Wright.

"*Short-tailed cat of the Texans; gato montes of the Mexicans; no-mē of the Yuma Indians; Chimbi, Cochimies of Lower California.*—In the sierras of Pimoria alta (Sonora) this lynx seems to be quite common, and as we found traces and specimens of it also on the lower Rio Bravo, we may consider its range going from ocean to ocean. The Spanish name of this species points also to its more extended vertical range.

"Our collection contains two specimens, mother and daughter, from the Sonorian mountains, near Fort Yuma, and one individual from the lower Rio Bravo, near Laredo.

"Of the first two specimens, the young one was killed first on the verge of a rock; the instant it fell the mother appeared for its defence, but quickly shared the same fate. The one from the Rio Bravo del Norte appeared one afternoon in front of our camp, on the other side of the river, but on seeing us retired instantly. Our hunters, however, crossed the river, and brought the dogs on the scent. They took the only outlet of a narrow bottom, which was hemmed in all round by vertical banks. Thus the sport was sure, of which the poor victim became soon aware. Besides the barking of the dogs, we heard the valley resound three or four times with the lynx's fighting call. This note, which was furiously thrown forth, was loud and abrupt. It resembled very much, on a smaller scale, the roar of the puma under similar circumstances."—(A. Schott.)

12. CANIS OCCIDENTALIS, var. MEXICANUS (p. 113.)—Lobo Wolf.

This wolf is of quite large size, with a rather narrow head. The ears are large and thickened, rounded at tip, more so than in a skin of *Canis nubilus*, and with a greater amount of hair in the cavity. The feet are large, the pads broad, and of considerable surface. The tail is rather long, exceeding half the length of body and neck without the head; it is covered with long hairs, but is not very bushy, owing to the comparative deficiency of soft fur. The hairs between the shoulders and on the anterior of the back are much longest, and form a kind of mane.

The prevailing colors of this species are a dirty yellowish or dull rusty whitish, with cloudings of pure black, the hairs on the back and upper part of the sides being largely tipped with this color. The lower part of the sides and the under parts generally of the body and tail do not show any black tips in the whitish ground. The throat, however, exhibits a very distinct collar of black caused by dusky tips to the hairs.

The head exhibits a good deal of black shading in the greyish ground. The edges of the lip and the under jaw are dark dusky. There is a decidedly rusty tinge in the ground color of the muzzle, which again reappears as a paler tint in the crown and around the adjacent bases and convex surface of the ears. The band on the throat referred to is five or six inches long, and just in front of the shoulders; it is produced by black tips to the hairs as on the back. The black shading on the sides of the neck is continuous with this, and together they encircle an unmarked space on the upper part of the throat.

The legs are rusty white, deepest on the carpus and on the posterior part of the hind leg. On the fore leg is a narrow dusky longitudinal line of mixed black and greyish hairs, forming a conspicuous mark. There is no evidence in the present condition of the skin of fasciæ on the sides of the body.

The tail, like the rest of the body, is greyish white, with the heirs on the upper part and extremity largely tipped with black. There is less of this on the sides, the lower portions of which and the entire under surface are uniform yellowish gray white, except near the tip.

The base of the under fur is rather light brownish plumbeous, varying a little with the region of body; the terminal portion shades into dull yellowish grey, with a tinge of rusty along the back. The long hairs where the black appears are mostly black with a varying central portion greyish white, and sometimes with the extreme base of this color. The black tipped hairs of the tail show this color only on their terminal portion.

$^{1}\frac{1}{1}\frac{1}{1}$. Santa Cruz, Sonora. Dr. Kennerly.

Measurements.

Length from nose to root of tail, (skin much shrunken).	36 inches.	Foot from carpus	6¼ inches.
Tail to end of bone	14 inches.	Hind leg from heel	9 inches.
Tail to end of hairs	18 inches.	Longest hairs on back	4½—5 inches.
Ears along anterior margin	3½ inches.	Length of skull	8½ inches.
Greatest breadth	2¾ inches.	Width of skull	4½ inches.

In the preceding account will be found the description of what is referable to the *Canis mexicanus* of authors; whether, however, the species is really distinct from that which inhabits the greater portion of North America, I am not able to state. The black chin and dusky collar I have not seen in any other specimens, nor are they mentioned in the descriptions of authors. It will be noticed, however, that the longitudinal stripe on the fore arm, supposed to be a characteristic of the European wolf, is present in this specimen.

The lobo wolf, described in the Berlandiere MSS. as *Canis torquatus*, differs in some respects from this, although agreeing in the main. The skull of Dr. Berlandiere's specimen (1379) is smaller than 2193, but similar in all essential features.

"Near Santa Cruz, in Sonora, we found this animal more common than we had observed it elsewhere on our route. It, as well as the coyote, were often destructive to the flocks around the village. It often, too, attacks the young cattle, both domestic and wild, of this region, which are forced to succumb to its great strength."—(C. B. Kennerly.)

12. CANIS OCCIDENTALIS, var. RUFUS, Aud & Bachm (p. 113.)—Red Texan Wolf.

The red variety of the wolf is said to be very abundant in Texas.

13 CANIS LATRANS, Say (p. 113.)—Prairie Wolf: Coyote.

The question is not yet definitely settled whether the coyotes of Texas and California and the prairie wolves of the Upper Missouri are identical or diverse. The materials collected by the Commission are not sufficiently extensive to throw any decided light on the subject.

128. Eagle Pass, Texas. Sumner, 1852. A. Schott.

Known throughout the length and breadth of New Mexico, Texas, and Northern Mexico as the coyote. During the day it may occasionally be seen sneaking about, but always at a respectful distance; at night, however, there are no bounds to its impudence, not only coming into camp, but stealing your provisions literally from under your nose. It occurs in greatest numbers about settlements; a carcass, however, will not fail to attract a pack in the most barren and unforbidding regions. Camped on a woodless and waterless prairie, the traveller has to wait in some hidden spot near at hand but a few minutes after his companions have taken up the line of march, to have the cheer of living objects in the form of coyotes, creeping in to feed an ever craving appetite upon the offal, or its distant and discordant howl, yet wary of its safe approach. The coat in summer is thin and dirty; in winter, clean and thick. The variety of note and amount of noise a single one is able to produce exceeds belief; their serenades are most usually heard at dusk and in the morning; a fresh scent, however, is liable to excite a howl at any time after night, and no sooner is the key note struck up by a single individual than others chime in from all quarters. The discordant and variable chatter of the cayote has no resemblance whatever to the bark of a dog, and is at once distinguished from the deep, sonorous, melancholy howl of the lobo. The wolf, as a similitude for starvation and poverty, is, perhaps, unequalled, as is indicated by the character of its excrement; this shows that the animal is at some seasons, in some localities, forced to live upon the cactus fruit and grasshoppers, and other matter even more indigestible and more opposite than these, and which must be as little palatable to its natural taste as the thorns that encase its food are disagreeable to its lips.

"Wolves have the bitterest of enemies in dogs; the sharp teeth and rapid snap of the former, however, require but a short time to rid them of the most furious attacks. On one occasion, while at the copper mines, three dogs attacked a single wolf,

and, after an encounter of but a few minutes, one returned so lacerated as to cause its death within a week. Notwithstanding this enmity, traces of the wolf are unmistakable, and frequently seen among many of the dogs of Northern Chihuahua and Sonora. The inhabitants here make but two classes of the wolves, coyotes and lobos."—(J. H. Clark.)

"This animal, so common in Texas, is also found in great numbers west of the Rio Grande, extending even to the shores of the Pacific. Generally going in small bands, and frequenting, for the most part, the vicinity of the settlements, they are often a great annoyance on account of their depredations among the sheep and goats, which constitute the principal wealth of many of the inhabitants. And although generally preferring the night for their excursions in search of prey, and preferring to conceal themselves during the day in the grass, bushes, or rocky and solitary places, yet we have known them at El Paso del Norte to exhibit so much boldness as to come within the suburbs of the town, and prowl around among the houses in search of food, while it was yet light, rarely being disturbed by the dogs, with which they even seemed to live on quite familiar terms. Indeed, we have been assured by some of the inhabitants along the Rio Grande, that it is not at all uncommon for the coyote to cohabit with the domestic bitch; but notwithstanding we made great efforts to procure or even see the offspring resulting from this intercourse, we did not succeed in finding one where the proof was indubitable.

"During our march from the Rio Grande to Los Nogales, in Sonora, there was scarcely a night that these animals were not in the vicinity of our camp. Indeed, we have reason to believe that the same individuals often followed us for days from camp to camp, occupying each successive one as soon as left by us, and making a feast of the scattered fragments, and then hurrying on and trailing us to our next stopping place. During the day they were not very often seen, but at night their proximity was generally betrayed by their loud and peculiar bark. This bark is very different from that of the dog, and does not at all resemble the dismal howlings of the large species or Lobo. It is entirely unlike the noise made by any other animal of the prairies, and, when once heard, can never afterwards be mistaken. It is very sharp, quick, and varied, and two or three coyotes, joining in concert, make such a noise as might lead one who had never heard them before to suppose that there were thirty or forty animals present.

"The boldness which they exhibited about the camp when hungry was as surprising as it was often annoying. They sometimes robbed the cooks of what they had set aside for breakfast, even in covered pots or kettles; and should a piece of fresh meat be left hanging on some neighboring bush, it was almost sure to disappear before morning; and sometimes even harness or the equipage of riding animals might be dragged away or seriously injured by them, especially if it had been recently greased, and left carelessly in the night a little distance from the men.

"The coyote is not very swift, and can be readily overtaken on the open plain by a horse of ordinary fleetness; this is a plan sometimes adopted for their capture with the lasso, or shooting them with a pistol.

"I have never known it to attack the larger quadrupeds. It seems to depend mostly for subsistence in the desert regions, and those removed from the settlements, in hunting rabbits, rats, young birds, &c. I have never known it to attack a man, unless wounded, when it defends itself with fierceness and desperation."—(Dr. Kennerly.)

"*Prairie wolf of the Texans; coyoti of the Mexican; coyotl of the ancient Mexican; hay of the Apaches.*—There is no other quadruped forming so prominent a feature in the fauna of our western countries as the coyoti. Its importance in relation to man may be subordinate to that of the puma, jaguar, bear, or some of the ruminantia, but this deficiency is sufficiently counterbalanced by its numeric existence and some usefulness. This animal is called upon on one side to counteract an exuberant growth of organic life, both animal or vegetable, and also to clear the surface of dead matter, which otherwise would infect the atmosphere with unhealthy miasmata. What, too, the coyote may lack in size and muscular strength is sufficiently supplied by its activity, tenacity, and endurance.

"To almost every traveller the coyoti becomes first known by his howling about sunset or sunrise, in which several individuals usually join. This twilight call grows regularly into a piteous whimpering, and is almost invariably preceded by the short and sharp barking of one or two individuals, to which the others fall in instantly. It is, however, kept up only for a few minutes, after which the congregation seem to disperse, each individual following its sport by itself. In the morning about daybreak, often nearer to sunrise, a similar congregation takes place and ends in the same manner.

"To what purpose the coyotis hold their daily meetings can be but conjectured, and may not improperly be put on the same ground with similar gatherings of the crows or migrating birds before their journeys.

"Such gatherings of animals otherwise living and breeding in herds or flocks do not involve particular questions, but with the coyoti, which leads a solitary private life, and joins his kind only before scouting, it is different." —(A. Schott.)

14. VULPES VIRGINIANUS, Rich. (p. 138.)—Grey Fox.

The determination of this animal as an inhabitant of Texas rests on specimens collected on the lower Rio Grande by Mr. Schott. It is found all through the United States, from the Atlantic to the Pacific ocean.

For a full description of the skin and skull of this fox I would refer to the report on the mammals of the Pacific Railroad Survey.

201. Lower Rio Grande, Texas. Skin. Arthur Schott.—130. Eagle Pass? Skin. Arthur Schott.

"The grey fox, or *zorro* as it is called by the Mexicans, is not a very uncommon animal in Texas and New Mexico. In those regions it is generally found along the valleys of the streams where the tall coarse grass or bushes afford it a place of concealment, or in the rocky and solitary places on the hill side. In these spots it will frequently lie still while you may pass within a few yards of it, closely watching your movements, but as soon as it finds that it is discovered it makes a hasty retreat, passing rapidly through the grass or bushes, occasionally making a bound.

"I have never heard it utter any cry whatever, and am much inclined to doubt, as has been said by some, that it either builds its nest in the tops of the trees, among the branches, or even climbs them at all. (See translation of Berlandiere MSS., Art. *V. cinereo argentatus*.) I have seen this animal several times in or near groves of large trees on which the mistletoe grew in great abundance, but never saw in them a nest of any kind that would accommodate a fox, nor did I ever see the animal on a tree or take to one when frightened.

"Although this animal has been found on the Pacific coast in California and Oregon, yet in our route we did not observe it west of the Sierra Madre."—(C. B. Kennerly.)

"*Grey fox; zorro of the Mexican; Colish of the Apaches.*—According to my observations this animal was more frequently met with in the valley of the Rio Bravo than anywhere else. In the list of the quadrupeds of Lower California a fox is also mentioned, but no description given. Whilst at Fort Yuma I learned from Major G. H. Thomas, then commanding officer there, that two apparently different species of the fox are known in that vicinity. The country forming the head of the California gulf differs so materially from any other in these latitudes that one or two different species of the genus may be expected there.

"The note of the grey fox, which we heard occasionally, resembles somewhat the bark of the coyoti, but is far less abrupt, so that it would be inappropriate to call it bark.

"Though this animal seems to be chiefly nocturnal, it is often met with sporting in broad daylight.

"The rocky clifty banks of the cretaceous formation, together with a more developed vegetation along the middle and lower Rio Bravo, seem especially to favor the haunts of this desert thief more than any other country.

"The natives consider the grey fox a much weaker animal than the common one, as he is easily run down. The specimen of our collection was surprised in a Mexican house at 'Pietras negras,' run down, and killed with a stick.

BASSARIS, Licht.

The species of the genus *Bassaris* look much like a cross between the fox and raccoon, having the cunning look and much of the form of the one, with the ringed tail of the other. The body is more slender than in the foxes, but stouter than in the common weasels; in fact, having much the proportions of the minks, *Putorius vison*. The hair is nearly as long as in the foxes, moderately soft and furry, with longer hairs interspersed. The ears are well developed and erect, pointed and naked on the outer side, but coated on the inner with short hairs. Their posterior edge is split, as in other carnivora. The head is sharp pointed; the naked muzzle quite large; the whiskers very bristly and long. The eyes are rather large. The tail is about as long as the body, quite bushy, though depressed and ringed alternately with black and white. The feet are all five-toed; their under surfaces hairy, except on the pads and balls of the toes, which are naked, and seem to possess a high degree of tactile sensibility. The claws are short and partially retractile.

The number of vertebrae in No. $\frac{1612}{4}$ is as follows: Cervical, 7; dorsal, 13; lumbar, 7; sacral, 3; caudal, 24, with one, perhaps two, lost at the end.

15. BASSARIS ASTUTA, Licht. (p. 147.)—Civet Cat.

Sp. Ch.—About the size of the house cat. Above brownish yellow, mixed with grey; beneath, whitish. Tail white, with seven or eight brownish black rings.

Size about that of the domestic cat, but rather more slender. Whiskers long, extending back further than the ears. Ears naked externally, except near the margins, where they are scantily haired.

The general color of the upper parts is a dull brownish yellow, with pale hairs interspersed. This tint is, however, much relieved throughout by long black hairs, sometimes imparting quite a dusky hue. The under parts generally are of a yellowish white, with, however, a brownish suffusion along the lower part of the flanks. The tips and edges of the ears, a spot above and below the eye and the upper lip are also yellowish white. The fur is all dull plumbeous at the base and paler at the tip, as described. Of the longer hairs interspersed, some are entirely black throughout, others black only at the tip, the basal portion being paler than the ground color, and producing the effect already referred to. The whiskers are black and white mixed. The basal inner surface of the ears is coated with dusky hair.

The tail may be described as dull white, with seven or eight rings of brownish black and a black tip. These rings are interrupted on the lower side for about one-fourth, so that the central portion of the under surface of the tail is white. The black and white hairs are of uniform tint to their bases, so that one color overlaps the other. These rings become wider and wider from the base to the tip, preserving, however, the same relative proportion of length throughout. Towards the base of the tail the black rings exhibit a considerable mixture of dull yellowish brown, caused by annuli of this color on the hairs near the tip.

A specimen of this species, collected by Captain Marcy, on Red river, in July, 1852, is much purer in its tints, the tail being clear black and white throughout, without any mixture of yellowish brown. The ground color of back and sides exhibits a considerable admixture of greyish ash, especially about the face and shoulders. The black hairs, too, seem concentrated along the middle of the back, forming quite a distinct longitudinal band from the nose to the tail.

Measurements.

	133.		4.			? 37.		
	Inches.	Lines.	Inches.	Lines.	100ths of length.	Inches.	Lines.	100ths of length.
Nose to root of tail	17	6	16	6	.....	17	.....	.....
Tail from root to end of vertebræ	16	.....	15	5	.....	16	.....	.....
Tail from root to end of hairs	18	.....	17	3	.....	18	.....	.....
Ears, height above notch	1	5½	1	6	.....	1	5	.....
Ears, width	1	5	1	6	.....	1	4	.....
Arm, fore foot to end of claws	1	7	1	7	.....	1	6	.....
Leg, hind foot from heel to end of claws	2	7	.....	.....	.....	.....	.....	.....
Skull, length	.....	.....	3.20	.....	100	3.26	.....	100
Skull, width	2.02	.....	1.88	.....	.59	2.04	.....	.63

In the spring of 1852 (April 23) a specimen of *Bassaris* was killed in a hen-roost, near Washington, after it had committed great devastation among the poultry of the neighborhood. It had evidently escaped from confinement, as shown by the marks of a collar around the neck. There was, of course, no indication whence it came originally, but it was supposed to have been brought from California. This specimen is somewhat different from those obtained in Mexico and Texas, although perhaps not specifically distinct. The tail is strikingly different in having the black rings fewer in number and of much greater extent compared with the white portion. Of these black rings there are only five distinctly marked ones besides the tip, and the last or sub-terminal one is more than two inches long instead of about one. Below, the black ring is nearly complete, separated only for the thickness of the vertebrae by the white of the under surface. There is no appreciable difference in the colors of the remaining portions of the body. The ears are decidedly smaller. Very considerable differences are discernible between the skull of this specimen and the others; the cranium is broader, but more constricted behind the orbital processes of the frontal bone; the distance between the zygomata is considerably greater, and the temporal crests of opposite side much closer together. The pterygoid bones, also, are further apart. The proportion of greatest breadth of skull to length is as 63 to 100 instead of 59, as in No. 4, from Texas. Should the examination of further specimens show these distinctions to be such as to indicate a different species, it might be called *Bassaris raptor*.

133. Eagle Pass, Texas. April, 1852. Major W. H. Emory, U. S. A. A. Schott.—4. ♀. Devil's river, Texas. Colonel J. D. Graham, U. S. A. J. H. Clark.

"This cat-squirrel, as it is called by the Texans, lives among rocks or trees; though not a rare animal, its quiet and nocturnal habits renders it inconspicuous, and the procurement of a specimen consequently an unfrequent occurrence. But a single one was seen, and that a female, in the crevice of a rock, with four or five young adhering to the paps. To detach these required considerable force; previous to that time they showed no signs of discomfort, although the mother had been dead several hours. It is said to be a constant and common occupant of Mexican out-houses and deserted ranchos. The specimen obtained, when first seen, was asleep; it fought furiously with claws and teeth in defence of self and home, and displayed no disposition whatever to run off. It is easily tamed and even domesticated, and makes a mild and playful pet."—(J. H. Clark.)

16. PUTORIUS FRENATUS, Aud. & Bach. (p. 173.)—Bridled Weasel.

200. Ringgold Barracks, Texas. J. H. Clark.—239. Matamoras, Mexico. Lieut. Couch.

17. MEPHITIS MESOLEUCA, Licht. (p. 192.)—White-backed Skunk.

This species is said to be quite abundant in western Texas. Its range to the eastward is not yet ascertained, although Berlandiere refers in his MSS. to this or an allied species as occurring at Matamoras.

18. MEPHITIS VARIANS, Gray (p. 193.)—Texas Skunk.

This species is easily distinguished among North American skunks by the great length of its tail, which considerably exceeds the body. The body appears slender, compared with the common *M. mephitica*. The feet are large, the fore claws much longer than the hinder ones (nearly twice.) The palms are entirely naked. The soles are hairy from the heel to the base of the metatarsals, (or for about one-third;) entirely naked elsewhere. The tail, including the hairs,

is much longer than the head and body; its vertebrae about as long as the body without the head.

The hairs on the body are very long and bristly, though lustrous and rather soft. There is comparatively little under fur between the long hair. The hairs on the tail are very long, though shorter at the ends than on the sides.

The general color is a lustrous black; there is a narrow white streak on the top of the head from the snout to the occiput. On the nape, just back of the auditory opening, begins a broad patch of white, truncated anteriorly, and about an inch in diameter; this extends with sides nearly parallel to the shoulders, when it bifurcates and passes gradually round on the sides, and ceases above the thighs. Another narrower line, however, commences in continuation with those just mentioned on each side of the base of the tail, and extends for a considerable distance. The rest of the tail is black externally, but all the hairs are seen to be white for most of their length from the base; there is a white tuft on the middle of the tail, however.

Dimensions.

	No. 127.		No. 233.	
	Inches.	Lines.	Inches.	Lines.
Head and body	15	.....	16	1
Tail to end of vertebrae	15	.....	15½	.....
Tail to end of hairs	18½	.....	7	.....
Longest hairs on sides	6¼	.....	.....	.....
Skull	2 1/8	.....	.....	.....

This species, in common with *M. mephitica*, belongs to the true *Mephitis*, as restricted by Lichtenstein, and characterized by the presence of four teeth in the upper jaw, behind the canines, instead of three. In both species, however, the soles are entirely naked for their terminal two-thirds. The skull differs from that of *mephitica* in the considerably larger size of the last upper and penultimate lower molar, while the penultimate upper molar is smaller than in *mephitica*. The ramus of the lower jaw has the condyle much more elevated, the distance to the summit of the coronoid process being little more than to the lower angle, while in *mephitica* it is considerably more. The much greater length and amplitude of the tail constitute strong points of difference, as well as the less amount of the basal fur.

The long tailed Texas skunk has, I think, been erroneously referred by Audubon and Bachman to the *M. macroura* of Lichtenstein. This species is characterized, in addition to its long tail, by a simple and continuous non-bifurcating broad dorsal white band, truncated anteriorly, beginning at the nape and extending over the upper part of the tail; thus somewhat like *M. mesoleuca*. There is also a white tuft in the end of the tail. There is, in addition to the dorsal band, a long supplemental white stripe on the side of the body. Lichtenstein expressly remarks on the constancy of the above markings in different skins, while all the Texas specimens I have seen agree with the description I have given, (including two very small kittens from Matamoras,) in lacking the white back and lower lateral stripe.

Mephitis vittata, of the same author, has three white stripes on the nape and one lateral on each flank, with a white tuft in the end of the tail.

The description of *M. varians*,[1] by Gray, is very unsatisfactory; but there can be little doubt that he had this species before him, especially as the locality given is Texas.

This species is abundant throughout Texas, but has not been observed in California. Its southern and northern limits have not been ascertained.

709. ♂. Monterey, Mexico. Lt. D. N. Couch.—237. ○. Matamoras, Mexico. Lt. D. N. Couch.—127. Mier, Texas. April, 1852. A. Schott.—233. Eagle Pass, Texas. Sept. 1, 1853. A. Schott.

19. MEPHITIS BICOLOR, Gray. (p. 197.)—Little Striped Skunk.

Several skulls of a small skunk were collected at Indianola by Mr. Clark, which I refer to this species. No skins were, however, obtained, which throws some uncertainty on the question.

20. TAXIDEA BERLANDIERI, Baird. (p. 205.)—Mexican Badger.

Sp. Ch.—Similar to the *T. labradoria*, but smaller; above reddish gray, with a narrow white stripe extending from the muzzle to the root of the tail.

The differences between skins of American badgers brought from Mexico and those found in the more northern regions of North America have long since been pointed out by Richardson and Bennett, although supposed to be due to local causes entirely, and not indicating different species. I have not had the opportunity of comparing skins from Mexico and the northern United States; but an examination of several skulls in the Berlandiere collection, together with his MSS. description and figures, clearly point out distinctive characteristics. The name assigned by Berlandiere would have been retained, had it not been a so-called barbarous one, and as such not to be perpetuated, if unpublished, however much the propriety of changing it, when properly brought before the scientific world, might be questioned.

Bennett, in referring to this species, says, that with the same general form and pattern the California "variety" has a much darker ground color, of a blackish brown, and grizzled with white on the hinder part of the head. The middle white line shows indistinctly in several places along the back; in fact, the most striking external distinction is seen in the extension of the line on the top of the head, over the whole length of the back to the root of the tail.

Judging from a comparison of skulls, this species is smaller than *T. labradoria*. The true molars are, however, decidedly larger; the outline of the posterior upper one is triangular, the antero-internal angle nearly right angled, its sides about equal. The penultimate molar, too, is broader, with its axis more nearly transverse. In *T. labradoria* the posterior molar is smaller, the antero-internal angle rather obtuse, and the penultimate molar not so oblique. From these there results a greater interval between these two teeth, which are in contact only externally, instead of being applied against each other for half their contiguous sides. The coronoid process of the lower jaw is less elevated in *T. berlandieri* than in *T. labradoria*, while the condyloid is even higher in proportion.

A younger but quite mature specimen from the Berlandiere collection, with the teeth perfectly

[1] *M. varians.*—Tail elongate; black, with a narrow white streak on the forehead, a large square spot on the nape, and two narrow streaks between the blade bones. Tail black; base of the hairs white. Inhabits Texas.

unworn, although most resembling the others of the same collection, differs in having the true molars still larger. The last upper molar is shaped more like that of *T. labradoria*, but it has three lines of tubercles on the crown nearly parallel with each other. This tooth is of such dimensions that its longest (oblique) axis is equal to the distance between these molars themselves. The skull is narrower and shorter behind; the symphysis of the lower jaw shorter, &c. There is no mark to indicate whether this specimen came from Matamoras; from a widely remote locality there would be little hesitation on the part of any naturalist in making of it a distinct species.

21. PROCYON HERNANDEZII, Wagler. (p. 212.)—Black-footed Raccoon.

1386. Matamoras. Lt. Couch —1052. San Elizario, Texas. December, 1854. Dr. Kennerly.—1053. Devil's river. Dr. Kennerly,

"We found the raccoon quite common at various points on our road as far west as Janos, in the State of Chihuahua, but we did not observe it after leaving the country adjacent to that village.

"It prefers the vicinity of running streams where the bushes are thick, or where there are hollow trees in which it may make its bed. Although eminently nocturnal in its habits it sometimes comes out during the day in the desert places in search of food, especially when it has young. When pursued it takes immediately to the water, swimming with great rapidity and ease.

"We saw them often along the San Pedro river and other streams of Texas in November, along the Rio Grande in December, and very often along the Corralitas river in March and April. When there has offered no opportunity for its immediate escape into the water or impenetrable bushes, we have seen it throw itself back in a state of defence, showing its teeth in a threatening manner, but never heard it utter any cry.

"It is called *Tejon* by the Mexicans of the regions in which we have observed it, and its flesh is highly esteemed by them as an article of food."—(C. B. Kennerly.)

According to Dr. Berlandiere the habits of this species are precisely similar to those of the common raccoon.

Berlandiere speaks of the coati, "*Nasua fusca*," as common in the State of Tamaulipas, one in his possession having been caught in the "Sierra de Tamaulipas del Norte," where it is called apache, sometimes mapach.

22. PROCYON HERNANDEZII, var. MEXICANA, St. Hilaire (p. 215.)—Sonora Raccoon.

Procyon lotor, var. *mexicana*, St. Hilaire, Voyage de la Venus, Zoologie, I, 1855, 25; pl. vi. (Mazatlan.)

A single skin was brought from Espia, Sonora, by the Boundary Commission, which agrees perfectly with the figure and description of St. Hilaire in the Voyage de la Venus, based upon a specimen collected at Mazatlan. These localities are quite in the same zoological province, although somewhat distant. The illustrious author of the mammalian portion of the report of the Venus is quite satisfied that the specimen examined by him differs in nothing from the true *P. lotor* except in the intensity of coloration.

The size of the animal is about that of the average of *P. lotor*. The fur is quite as long as *P. lotor*, and appreciably softer, in this respect differing somewhat from the description of St. Hilaire. The feet appear to be rather slender, and longer than in *P. lotor*. They are scantily haired and naked in patches on some of the phalanges. The tail is about half as long as the head and body, or perhaps longer; it is fully furred with long appressed hairs, and tapers gently from the base to the tip, which is somewhat truncate.

The colors of this animal are similar in pattern to those of the *P. lotor*, but the tints show considerable difference. The body is much lighter and more rusty yellow in its general impres-

sion. The long hairs are tipped with dark reddish brown, rather than with black, the reddish becoming rusty on the posterior half of the back and on the sides, the median annulus being a pale rusty white. The under fur generally is of a chestnut brown, tinged with plumbeous towards the base, the colors darkest along the back. The long hairs on the sides generally, as well as on the arm, are whitish to the tips. The feet are whitish above, the hinder ones showing a slight tinge of chestnut on their outer portion.

The tail is tipped with rich purplish chestnut, and exhibits six distinct annulations of the same, with faint traces of a seventh; of these the terminal four only are continued all round, the others being obsolete beneath. The intervals are rusty whitish, and a little larger only than the dark rings. The contrast between the two is not marked very strongly.

The head is marked as in *P. lotor*; the dark patch passing obliquely across the eye is of a dark brownish black; darker than any other portion of the body. It extends back to the line of the commissure, and is there separated from a lighter patch of the same under the chin by a light line prolonged backwards from the edges of the mouth. The sides of the muzzle anterior to the cheek patch and the end of the lower jaw, together with the ears, are dull whitish; the upper and posterior border of the cheek patch is of rather a purer white. The spot behind the ear is plumbeous chestnut brown.

Total length (skin) to root of tail 27, inches.	Fore foot from wrist.....3.20 inches.
Tail to end of vertebrae..... 10 inches.	Hind foot from heel.....4 30 inches.
Tail to end of hairs..... 12 inches.	Length of skull.....4.30 inches.
Ear..... 2 inches.	

This animal, as already remarked, exhibits a close relationship to the common raccoon of the United States, *Procyon lotor*, although, in addition to the shade of coloration, it is readily distinguished from it by the larger and more naked feet and hands, longer, more tapering, and more narrowly annulated tail; the dark annuli being narrower and more distinct. It is in these characters that *P. hernandezii* differs also from *P. lotor*, and it is with *P. hernandezii*, accordingly, that the comparison must be made. There is, in fact, no very appreciable difference, except in shade of color. It is only necessary to replace the black tints on the body of *P. hernandezii* by a dark reddish brown, and the dark brown by a chestnut, in order to reproduce the colors of the Sonora specimen. The chestnut tinge replacing the brown of the hind feet is very slight and quite inconspicuous, except on close examination.

It may be mentioned that the stiffness and coarseness of hair in the Mazatlan specimen, together with the scantily haired condition of the feet, was probably owing to its occurrence within the Tierra Caliente of Mexico. The specimen from Espia, taken in the winter months at a greater altitude, and farther north, is naturally found to be clothed with a much softer and fuller fur.

In some respects this specimen approaches in external appearance the *Procyon cancrivorus* of South America. The latter is, however, much redder in its general colors, the tail longer, with more rings, the cheek patch smaller, being rather a dark border to the eye than a patch on the side of the head. The lower part of the legs is dark brown, and the toes more naked above.

A second specimen was seen by the party of the Boundary Commission, which agreed very well with it in general appearance.

The following table contains the measurements of the skull of this species as compared with those of *P. hernandezii* and *P. lotor*.

Skulls of *Procyon*.	*Procyon hernandezii*. No. 1837. Matam ras.		*Procyon lotor*. No. 898. New .		*Procyon hernandezii*, var. *mexicana*. No. 3088, 1051. Espia, Chihuahua.	
	Inches.	100ths of length.	Inches.	100ths of length.	Inches.	100ths of length.
Total length	4.80	1.00	4.50	1.00	4.40	1.00
From intermaxillaries to condyles	4.67	.97	4.33	.96	4.30	.97
Greatest width	3.17	.66	2.94	.55	.....	.....
Greatest height above base of occiput	1.50	.31	1.45	.32	1.50	.34
Distance between orbits	1.08	.22	.87	.19	.93	.21
Nasal bones, width before	.60	.12	.55	.12	.43	.09
Narrowest part of muzzle behind incisors	1.08	.22	.97	.21	.96	.21
Upper incisors from front to molars	1.20	.25	1.20	.26	1.13	.25
Upper incisors from front to hinder margin of palate	3.00	.62	2.76	.61	2.60	.59
Upper incisors, width between external edges	.70	.14	.63	.14	.60	.13
Upper molars, length taken together	.93	.19	.80	.17	.90	.20
Upper molars, least distance between	.87	.18	.70	.15	.66	.15
Between line of orbital processes to occiput	3.10	.64	2.87	.63	2.85	.64
Between line of orbital processes to end of nasals	1.60	.33	1.47	.32	1.43	.32
Between line of orbital processes to end of intermaxillary	2.40	.50	2.20	.48	2.20	.50
Orbit to end of intermaxillary	1.67	.34	1.50	.34	1.50	.34

1051. Espia, Sonora. April, 1855. Dr. Kennerly.

23. URSUS HORRIBILIS, var. HORRIAEUS, Baird.—Sonora Grizzly Bear.

Size less than the grizzly of the Pacific coast. Head very broad. Ears and tail nearly equal. Fore claws twice as long as hinder ones. General color dark brownish, with the tips of the hairs much lighter, (of a dirty amber yellow.) No distinct indication of dark stripes on the back and sides.

A single skin of this animal was collected by Dr. Kennerly, at Los Nogales, and brought home. Owing, however, to the excessive heat of the country, the skin appears to have been almost burnt, and contracted to such a degree as completely to obscure the proportions. In its present condition, it is less in size than the average of black bears, while originally the body was nearly as large round, and as long as that of a year old colt.

The prevailing characters of the animal are essentially those of the grizzly of the Pacific coast, in the large feet, elongated claws of the fore foot, &c. The ears are rather short, and completely concealed among the adjacent hair. The tail is very short, and entirely concealed; about as long as the ears.

The feet are very broad and large; the fore claws much larger than the hinder. The longest (removed from the skin) measures four inches along the convexity, half an inch of this, however, is implanted in the skin. The fingers are of nearly equal length, the first and fifth rather shortest, especially the former or thumb; the central claws are longest. The palm is naked, composed of a soft, highly papillose skin. There is a large central pad, rather broader than long, covering most of the foot; behind this, near the exterior edge, is a small circular pad,

separated by a deep transverse crease, coated with hair; the naked balls of the fingers, also, are in nearly a straight line, and separated from the central pad by a transverse furrow, also well coated with hair. On the hind foot there is a single large naked pad, seven inches long, and between five and six inches wide, separated from the balls of the toes by a hairy transverse furrow. These balls diminish progressively from the exterior to the interior; the latter toe shorter than the rest. The longest claw measures about two and a quarter inches.

The hair is coarse in texture generally, and there is little under-fur. It is longest posteriorly and on the sides. The prevailing color of the exterior is a dull pale brownish yellow, with an amber tinge. The tips only are of this color; the basal and larger portion, with the intermediate wool, being of a dark chestnut brown, then passing into a pure blackish nearly to the yellowish tip. Immediately along the centre of the back the blackish tinge in the hair predominates decidedly, as it does (to less extent) posteriorly. The belly and inferior surface of head and throat are nearly of a clear brownish yellow. The legs are of a blackish brown, with a slight tinge of chestnut, the hairs very slightly tipped with yellowish.

There are some points in which this grizzly bear differs from specimens collected on the coast of California, but it will require the examination of a larger number to settle fully the question of permanent characteristics. The ears are shorter, and the tail longer than in the coast grizzly, the two being nearly equal instead of the ears being twice as long as the tail. The central large pad beneath the fore foot is longer in proportion to its width. The fur is decidedly softer, and the colors differently arranged. Thus there is not the conspicuous space along and behind the shoulders, with the hairs uniform yellowish to near the roots, as in the coast grizzly. On the contrary, the hair here is scarcely more largely tipped with yellowish than in the other parts of the body.

Skull. Two skulls of this species indicate very great age in the height of the sagittal and temporal ridges, the obliteration of all the sutures, and the much worn condition of the teeth. Compared with corresponding specimens of the California grizzly, the animals must have been nearly one-fourth less. The profile is much the same as in the California grizzly; in the oldest specimen (990) curving rapidly up from the occiput over the posterior third of the parietal bones, thus passing in a straight but slightly ascending line as far as over the posterior third of the frontal, then sloping rapidly downwards to the end of the nose, at first in almost a straight line, then gently concave. In one specimen the broad forehead is slightly concave transversely, in another it is straight; the orbital process in each being very convex externally. There is, however, no convexity in either specimen between these processes in either a longitudinal or transverse direction.

The point of greatest elevation of the profile curve marks the place where the sagittal crest bifurcates, and is continued on each side as a distinct temporal ridge, elevated above the plane of the forehead.

The under surface of the head is decidedly hollowed out, the lower profile exhibiting a considerable concavity, in this respect approaching the Polar bear. Thus a straight line tangent to the bottom of the notch between the occipital condyles and to the end of the intermaxillary will pass three-quarters of an inch above the palate.

A careful comparison of specimens of the grizzly bear, collected by the Commission, with a series from the Pacific coast, exhibits certain differences, which seem to be of importance. In

the first place, as already remarked, the size of the animal is considerably less, probably by about one-fourth. The skull is also broader. Thus comparing No. 995 from the Coppermines, which is very young, but has all its permanent teeth, with 1220 from Monterey, in which all the teeth are in place, except the canines, which are about half way out, we find the former to be a very little longer, but with the zygomata .55 apart instead of .52. This difference lies in the size of the temporal fossae, the cranium proper being largest in 1220. The orbital processes are situated farther forward; the zygoma is longer, especially when measured on its free lower margin. The profile is much the same. The muzzle is narrower and more slender. Viewed laterally, the muzzle is seen to be lower than in the California grizzly, especially above the malar bone. The malar is much lower anteriorly, and the portion extending towards the anterior canthus is shorter and narrower. The distance from incisors to end of molars, as well as to end of palate, is half an inch less, though the animal is older, and the skull a little longer. The palate is more vaulted.

The lower jaw of No. 995 differs from the California specimen in being lower and having the coronoid process longer along its base. The distance from the back of the condyle to the first molar is about one-third the distance to the end of the incissors, instead of one-fourth, as in No. 1220.

The differences in the teeth of the two specimens are quite appreciable. As a general thing those of 995 are in every way much smaller in all dimensions than in the other, though considerably larger than in *U. americanus*. The three posterior upper molars measure 2.62 inches in the one, in the other 3 inches. The chief disproportion is in the posterior molar. This molar has the usual three tubercles or lobes along the inner edge and the two outer ones; instead of having the posterior half of the tooth behind the second outer and exterior to the second and third inner tubercles, stoping obliquely outwards and upwards, and with a general wrinkling of the enamel only, there is a third outer tubercle midway between the middle one and the posterior extremity of the tooth. The narrow space between this tubercle (which is not so high as those anterior to it) is occupied by a few enamel granules. The space between the two marginal series of tubercles is much less. The third upper molar from the end is broader. As in other species the crown of this tooth is divided longitudinally by a deep ravine, exterior to which is a series of two-pointed and trenchant tubercles, the posterior one of which exhibits a supplementary notch behind. The inner side of this ravine is occupied by a series of low tubercles, separated by furrows, both on the summit and inner side of the tooth; the central tubercle rather longest. In the other skull there is but a single trenchant or compressed tubercle, without any trace of subdivision.

The lower molars are very similar in the two specimens, except that they are smaller and narrower in No. 995. In both the posterior molar is triangular, the base anterior; in No. 995, however, the width is about three-fourths the length, and the whole tooth is considerably shorter than the second in advance of it, instead of being nearly equal, as in the Pacific specimen, where, also, the width of the tooth is little more than half the length.

The comparison of large skulls brought in by the Boundary Commission with corresponding ones from the California coast exhibits much the same differences as to the teeth; the bi-lobed or tri-lobed character of the inner half of the first large upper molar being maintained, as also the proportional inferiority in the size of the teeth, and the short longitudinal dimensions of the

posterior molar above. The posterior root of the zygomatic arch, viewed from above, is narrower and more emarginated behind and before. The base of the head is much more arched longitudinally, in this respect approaching the Polar bear It has been already stated that a straight line tangent to the occiput and intermaxillary passes three-quarters of an inch from the bottom of the palate, instead of less than half an inch, as in the California bears.

As the result of the above comparisons, I have come to the conclusion that the grizzly bear of the southern Rocky mountains differs appreciably from the grizzly of the Pacific coast in smaller size, smaller teeth, rather broader head, and the other features adduced above, so that there is no difficulty in distinguishing them. Whether this is indicative of a different species or merely of a local race, I cannot say; an examination of corresponding specimens from the Upper Missouri, which I hope hereafter to make, will throw much light on the subject.

I have had no means of comparing the adult skulls of this bear with those of *U. arctos* of Europe. The latter species, however, as shown by a two year old skull, 1033, from Sweden, is considerably broader. The teeth are of much the same size, those of *arctos* rather larger. The last upper molar in the European bear has the posterior half more free from tubercles and more twisted, and the wrinkles on the crowns are finer and more numerous. The third molar from behind is much narrower in *U. arctos*, in this respect even exceeding the California grizzly; the inner lobe is single and much reduced in size. The posterior lower molars are of smaller shape and proportion.

This bear exceeds the *Ursus americanus* and *cinnamoneus* very much in size, and has other differences, which are readily appreciable. The arch of the head does not extend in a uniform convex curve, as in these species, and the forehead is plane and even concave; the anterior portion of the dorsal outline is usually convex in the small species. The proportional width of the head is less in the present species; the muzzle is longer. The zygomatic arch is more massive, especially the posterior portion, which is as high or higher than the anterior, instead of being considerably less. There is a much greater concavity of the posterior half of the palate than in *Ursus americanus*, where this is quite convex, and with various ridges not seen in the present species. The notch of the palate is distant from the posterior upper molar by the length of the latter tooth, while this distance is considerably greater in the smaller bears.

The most appreciable differences, however, next to the shape of the zygoma, size and proportion of the head, &c., are found in the teeth. These are proportionably very much larger than in *U. cinnamoneus*, and appreciably exceed those of *U. americanus*. The third upper molar from behind is, in particular, larger, broader, and with two or three lobes on the inner half, instead of a single and much smaller one. The crowns of the molars generally are more tuberculated, and less finely wrinkled than in *U. americanus*.

Skull.	990 ♂ Copper mines.	
	Inches.	100th of length.
Total length	14.20	1.00
From end of intermaxillary to end of condyles	13.10	.92
Greatest width	8.20	.58
Greatest height above base of cranium	4.40	.30
Distance between orbits	3.10	.21
Distance between orbital processes	4.70	.33
Nasal bones, width before	1.40	.09
Narrowest part of muzzle behind canines	2.80	.19
Upper incisors from front to molars	3.20	.22
Upper incisors to hinder margin of palate	6.95	.48

Skull.	990 ♂ Copper mines.	
	Inches.	100th of length.
Upper incisors, width between external edges	1.87	.13
Upper molars, length taken together	2.80	.19
Upper molars, least distance between	1.80	.12
From intermaxillary to commencement of orbit	5.70	.40
Between post-orbital points of occiput	7.80	.54
From post-orbital points to end of nasals	4.64	.32
From post-orbital points to end of intermaxillary	7.40	.53

147. ♂. Los Nogales, Sonora, June, 1855. Dr. Kennerly.—990—995. ♂. Copper mines, N. Mex. J. H. Clark; skull.

"The black bear is the most common in southwestern Texas. A brown bear occurs here also, which I think can be hardly identical with the brown or grizzly of northern Chihuahua and Sonora. The brown bear of the former place is smaller, and is most usually met about water courses; these furnishing both cover and food, it is true there is but little inducement for it to wander out on the open prairie. The black or grizzly was found abundant in all the mountainous regions traversed west of Rio Grande. Late in the summer they leave the mountains for the open prairie, it is said by frontiersmen, for some plant which is relished much, and which ripens at this season. What that plant is I was never able to ascertain. As far as my observation extended, they make an annual migration from the rugged and unfrequented mountain, which they habitually inhabit late in summer, and probably because the supply of acorns, piñones, and cedar berries, their principal food, is exhausted at this season. Its habitat in the mountains is marked by upturned rocks, which seemed to be displaced for the sake of insects and other animals harboring under them, and loose soil torn up in pursuit of the roots of the cedar and other trees. Notwithstanding its awkward and ungainly gait, where the country is at all rough and broken, it will easily outdistance a mule. I have known this bear, when surprised and suddenly startled, to make a snuffling blow, or a respiratory grunt, which is, I believe, the only sound it is capable of producing. Once entering a grassy depression of prairie near the Cobre, I was surprised to see three of these bears sitting on their haunches at a short distance, to all appearances, calmly watching our approach; it was soon evident that they were only reconnoitering, for no sooner did they get the scent of us, than they put off at as rapid a rate as possible. As a rule, they avoid the vicinity of man; yet they have been known to come into camp after the offal after night, and even in day."—(J. H. Clark.)

"In regard to the bears that are found along the northern frontier of Mexico and the southern portion of New Mexico, there seems to be some confusion. In addition to the common black bear, *Ursus americanus*, and the large grizzly, *U. ferox*, there is found another animal, intermediate in size to these, generally of a brownish color, with the tips of the hairs often silvered, especially in the old individuals, and in appearance, except size, is almost identical with the *U. ferox* found in such great numbers n California. Among the people of the country they are known as *brown bears;* but this term is variously modified by the most experienced hunters, as we have heard applied by them, to the same individual, the names grizzly bear, touch of the grizzly, cross between grizzly and brown bear, and common brown bear; but on no occasion have we heard them assign any relationship between these animals and the common black bear, causing us to believe that there must be a considerable difference between this animal and the brown bear of Oregon, which is called by naturalists only a variety of the black; in fact, its size, generally, would necessarily preclude such comparison, while even the very old individual falls far short of the weight and dimensions of the *U. ferox* of California, of which we could much more easily consider it a variety than of the *U. americanus*.

"These animals were observed by us in greater or less numbers in the San Luis mountains, the Sierra Madre, and at Los Nogales; being particularly numerous at the first and last named localities. We were assured by the Mexicans of Sonora, who

also distinguished this animal from the grizzly, that it was feared by themselves, as well as by the Indians, more than the latter, on account of its ferocity. This, however, admits of a considerable degree of doubt; for, notwithstanding some very good proofs of its boldness within our own knowledge, we also observed almost unexampled evidence of its cowardice. While, on one occasion, a very old male rushed unexpectedly from the bushes and made a fierce and unprovoked attack upon a gentleman of the Boundary Commission, who, probably, only saved his life by a fortunate escape into a neighboring tree, we observed, on a subsequent occasion, in the same vicinity, a female entirely forsake her cubs by a rapid retreat, and without being wounded; and this, too, notwithstanding the cries of the little ones while we pursued and captured them; she only looking around once, at a distance of half a mile, raising herself on her hind feet in a menacing manner, then again fled rapidly over the hills and disappeared. In the same region, a very large female grizzly defended her young with great desperation, and only fled after the cubs were entirely beyond the reach of the hunters, when she made her escape, covered with wounds.

"The food of these animals, in this country, consists of acorns, walnuts, piñones, (the fruit of the *Pinus edulis*,) manzanillas, the fruit of an ericaceous shrub, and such animals as they are able to capture."—(Dr. Kennerly.)

"*Grizzly bear; oso of the Mexicans; shaz of the Apaches.*—Near the highest crest of the Sierra Madre, called 'San Luis mountains,' I had an opportunity to witness a rare butchery, by which, in less than one hour, a whole family of grizzlies was killed, without one offering the slightest resistance. It was about noon on the 11th of October, 1855, when our long trains, coming from the Guadaloupe Pass, in the Sierra Madre, towards the San Luis springs, met on the plains these unexpected mountaineers. When surprised, they were lying on the ground not far from each other digging roots. The position in which they performed this work naturally caused long narrow strips of grassy lands to be turned up and searched as if it had been done by a bad plough. I could not learn what kind of roots they had been looking for. After taking off the thick skin of these root-diggers, we found them all in a very poor condition, and this may account for the want of that resistance which they failed to offer. The ungrizzly-like behavior of these poor brutes induced the majority of our party to doubt their being grizzlies at all. They evidently had descended from the surrounding mountains, where they have their stronghold in the rough trachytic recesses of this part of the Sierra Madre, the highest crest of which is densely crowned by a dark growth of pines. There their fruit stores had probably given out in the late season, and they were obliged to resort to roots to satisfy their hunger."

24. URSUS CINNAMONEUS, (p. 228,)?—Cinnamon Bear.

? Ursus americanus, var. *cinnamomum*, Aud. & Bach. N. A. Quad. III, 1853, 125; pl. cxxvii.

Sp. Ch.—Size equal to or less than that of the black bear. Color various shades of brown, very rarely black. Skull broader than in the common black bear.

Several skulls of a small bear collected by Mr. Clark at the Copper mines of the Gila appear to indicate a species quite different from the common black bear. The animals to which they belonged were all of a distinct brownish color, except one, in which the hair was "glossy black and pretty long." Although about the size of the common black bear, *Ursus americanus*, or a little smaller, yet four skulls of all ages before me, when compared with a corresponding series of seven of *Ursus americanus*, exhibit such characteristic differences as to authorize the conclusion that the species are distinct. Unfortunately none of the skins collected were brought home, owing to difficulty of transportation and other causes, and it is therefore impossible to speak more definitely of the external characters of this bear beyond the color, which was said to be of various shades of brown, with sometimes a reddish tint, sometimes darker, the tips lighter. In these characters it agrees with the cinnamon bear of authors, supposed generally to be a mere variety in color of the common American black bear. There is, however, an essential difference between the two; the cinnamon bear of Oregon being uniform in the color of its hairs from root to tip. Should further comparison show in the cinnamon bear of Oregon the same cranial and other essential characters as the *U. americanus*, differing from the one in question, I should propose the name of *Ursus amblyceps*, in allusion to the great comparative breadth of the head.

I am not aware that any direct comparison has ever been made between the skins and skulls of the black bears of the eastern United States and those of the Rocky mountains and the Pacific slope. It is quite possible that they may be really distinct, and that the western species occurs in the black and brownish varieties, which would substantiate the impression that these two colors in that country belong to one and the same species. There is at any rate no essential difference between the skull of the "black bear" of the Copper mines and the brown bears from the same localities, all exhibiting the same characteristic features as distinguished from the black bear of eastern America. The black variety, however, appears to be much the rarer of the two.

Skull. For reasons already explained I shall select a middle aged skull to serve as the type of my description, and afterwards point out the differences of the very young and very old specimens. Number 994, the head of a female from the Copper mines, has the tubercles of the molars and the crowns of the incisors considerably worn, so as materially to obscure their characteristics, while in a skull of *U. americanus* of the same age the molars are perfectly entire. The sagittal crest extends over a little more than the posterior third of the parietal bone.

The profile of the head exhibits a very decided convex curve from the occiput to the middle of the nasal bones, after which it passes off nearly horizontally, curving downwards towards the tip. The outline is, however, more convex than in *U. americanus*, rising higher in the middle. The central region of the forehead from the coronal suture to the middle of the nasals is nearly plain or slightly convex, rounding off gently on the sides and to the tip of the post-orbital process of the frontal bone.

The outline from above exhibits a much greater breadth between the zygomatic arches than in the skull of black bear described (897), which is, moreover, a little older. Thus the greatest breadth is .617 of the total length, instead of .573. The projection of the end of intermaxillary beyond the end of molar is .316 of the total length; the least width between orbits is .227; the distance between the tips of the orbital processes is .34.

The lower jaw exhibits a decided character in the shape of its coronoid process. In this the upper end curves round into a decided hook, the posterior outline being very much emarginated.

Larger and older specimens exhibit a still greater breadth of head, amounting to as much as .629 hundredths, while still older heads of the black bear are but .597 hundredths.

This species, as already stated, differs very much in the width of the head from *Ursus americanus*; the width of the head being at all ages (except in the very young) more than six-tenths the total length in the one and less than this in the other. The upper edge of the zygomatic arch is a good deal more curved. The lower jaw exhibits a striking character in the great concavity of the hinder edge of the coronoid process, instead of the gentle curve of *U. americanus*.

There is quite an appreciable difference between the two species in reference to the anterior outline of the glenoid cavity. In one these outlines are in the same straight line, while in *U. americanus* they diverge anteriorly, so as to meet at an obtuse angle if produced backwards and inwards.

The molar teeth of *U. cinnamoneus* are much smaller than in *U. americanus*. Thus the three posterior upper molars in the largest specimen of *cinnamoneus* measure but 2.07 inches, the others less than two inches; in the smallest of *americanus* 2.22, in the largest 2.35.

In the description of this species I have not considered it necessary to make any comparisons with the other American bears, the grizzly and the polar, as these vastly surpass it in size. The *Ursus arctos* of Europe is also a much larger animal.

From a comparison of the teeth it is quite evident that the present species is less carnivorous than the *Ursus americanus* of the eastern States. Indeed, its food is said to consist in great part of the piñon or stone pine, and other seeds requiring a considerable amount of grinding before being swallowed.

Skull.	*Ursus cinnamoneus.* ♂. Gila. 991.		*U. cinnamoneus.* ♂ Gila. 992.		*U. americanus.* 988. ♀. Morehouse co., La.	
	Inches.	100ths of length.	Inches.	100ths of length.	Inches.	100ths of length.
Total length	11.50	1.00	11.10	1.00	10.30	1.00
From end of intermaxillaries to end of condyles	10.50	.92	10.60	.95	10.10	.97
Greatest width	6.90	.60	7.00	.63	6.00	.57
Greatest height above base of cranium	3.40	.29	3.20	.28	3.20	.31
Distance between orbits	2.55	.22	2.46	.22	2.30	.22
Distance between orbital processes	3.73	.33	3.63	.32	3.26	.31
Nasal bones, length	2.90	.25	2.90	.26	2.70	.26
Nasal bones, width before	1.14	.09	1.07	.09	1.03	.10
Narrowest part of muzzle behind canines	2.30	.20	2.28	.20	2.23	.20
Upper incisors from front to molars	2.80	.24	2.70	.24	2.30	.22
Upper incisors from front to hinder margin of palate	5.84	.50	5.60	.50	5.37	.52
Upper incisors, width between external edges	1.40	.12	1.45	.13	1.26	.12
Upper molars, length taken together	2.00	.17	2.07	.18	2.24	.21
Upper molars, least distance between	1.57	.13	1.63	.14	1.45	.13
From intermaxillary to end of nasals	4.90	.42	5.28	.47	4.47	.43
From intermaxillary to commencement of orbit	4.17	.36	4.38	.39	3.66	.35
Between post-orbital points to occiput	6.60	.57	6.20	.55	6.00	.58
Between post-orbital points to end of nasals	3.70	.32	3.67	.33	3.40	.33
Between post-orbital points to end of intermaxillary	5.80	.50	6.00	.54	5.10	.49

991. ♂. 992. ♂. 994. ♀. Skulls. Coppermines, N. M. J. H. Clark.

25. DIDELPHYS VIRGINIANA, Shaw, (p. 232.)—Possum.

The under-fur of this species is yellowish white, with dusky tips quite uniformly distributed over the body, most intense on the back. The legs are entirely dusky brown; the digits or fingers and toes yellowish white. The head is nearly pure yellowish white throughout, with only a dusky suffusion round the eye, and a dusky shade along the top of the head, widening and deepening into the brown of the back. The ears are black, with a yellow blotch on the upper edge; the tail is black on the basal fourth, the remainder yellowish white.

The long scattered hairs of the body are quite uniformly distributed and silvery white in color.

Length of head, 5 inches; of head and body, 20½; of tail, 14½.

I am not at present prepared to give the distribution of the common North American possum with any degree of precision. According to Audubon and Bachman its eastern limit is the Hudson river, while westwardly it extends to the Pacific ocean, and southwardly to Mexico. I

am, however, inclined to doubt the extent of this range. No evidence is before me of its existence to any great distance west of the Missouri, the south Texas and California species being probably quite different.

This species is not found in southern Texas, but is said to occur in its northeastern portion. I have given its characteristics with the view of illustrating more fully the character of the *D. californica*.

DIDELPHYS CALIFORNICA, Bennett, (p. 233.)—Texas Possum.

This species appears to be considerably smaller than the common possum of the north. The tail is as long as the body, exclusive of the head and neck; the portion covered with hair is only about one-tenth its length.

The ears are large and naked on both sides, higher than wide, and rounded at the tips.

The under-fur is yellowish white throughout, except the terminal portion, which, on the back and sides, is dark brown; nearly black along the middle of the back. This color is more diffused on the sides and beneath. The legs and feet are entirely dusky throughout to the claws. The under part of the head, including the entire lower jaw, is dusky. There is a dusky patch in front of the eye, which commences a little behind the nostril and passes through the eye involving the eyelids, and, extending backwards and curving downwards about as far from the eye as this is from the nose, becomes confluent with the dusky of the chin. There is thus a distinct light patch on the side of the head from the nose, widening behind and terminating in a rounded outline, convex behind. The top of the head is quite dusky, with a faint indication of a dark streak along the central line, the whole confluent with the dusky of the tail. The ears are black, with a yellow blotch in the upper edge. The tail is white, except the basal third, which is black.

The back and side are thickly interspersed with long, yellowish, silvery hairs, thickest along the median line, much scattered on the sides; these measure from two to three inches.

A younger animal (199) is similar to the above in the general pattern of coloration, but is almost entirely black or dark brown throughout, except the light patch on the cheek and one behind the ear. The long, soft hairs are wanting entirely, but the remaining fur is much coarser than in the specimen first described, the hairs black or dark brown, the basal half whitest. There are softer, shorter hairs interspersed, which are black only at the extreme tip.

No. 1058, from the Valley of Mexico, is similar to 138, but rather lighter. The basal half of the tail and the entire ears are black.

This species may be very readily distinguished from the *D. virginiana* by several characters. In the latter species the fingers and toes are white; there is more white on the ear. The head is greyish white, with only a dusky blotch immediately around the eye; but no such pattern of marking as described. The size of *D. virginiana* is considerably larger; its ears more rounded or less pointed above; the hairy portion of the tail longer.

The only other species with which a comparison is required is the *D. azarae*. In this the body is as dark or darker than in the present species; the head and neck are, however, white, with a single central dark stripe along the forehead to the dusky of the nape. The ears and toes are flesh colored. *D. aurita* is similar in some respects, but wants the well defined white

cheeks, and has flesh colored toes. *D. cancrivora*, though of dark pelage, has no well defined markings on the head; the long scattered hairs, too, are blackest.

This animal agrees pretty well with the *Didelphys californica* of Bennett, which, however, I cannot distinguish from the *D. breviceps*, except by the length of the tail, which, as given by Bennett, measures 16 inches, with a body of 12. Waterhouse, however, in redescribing the same specimens, gives the head and body at 17 inches; the tail, 14; which is much nearer the proportions of the specimens here described.

The *D. pruinosa*,[1] of Wagner, appears to be the same animal. The *D. californica*, of Burmeister, in Fauna Brasiliens, is described as having the ground color reddish brown.

Although there are some differences in the skulls of the *Didelphys virginiana* and those of the subject of the present article, yet I am not able to establish on them any specific characteristics. In fact, the variations in the thickness and length of the muzzle in different species, in addition to other points, are so great as to readily convey the impression, without a knowledge of the facts, of many more species than really exist. This will be more intelligible from the following measurements:

Measurements of skulls.

	DIDELPHYS VIRGINIANA.								D. CALIFORNICA.			
	2432, Georgia.		2430, Georgia.		680, Carlisle.		527, Carlisle.		1401, Matamoras.		1121, Texas.	
	Inches.	100ths.	Inches.	100ths.	Inches.	100ths.	Inches.	100ths.	Inches.	100ths.	Inches.	100ths.
Length of skull	5.05	100	4.80	100	4.86	100	3.65	100	4.40	100	3.50	100
Width between zygomata	2.85	56	2.50	52	2.90	60	1.98	54	2.60	59	1.75	50
Distance to orbits	2.19	43	2.10	44	2.18	45	1.61	44	2.05	46	1.55	44
Width of muzzle, behind canine	.98	19	.80	17	1.02	21	.67	18	.98	22	.68	19

Measurements of skins.

Current No.	Locality.	From tip of nose to—				Tail to end of vertebræ.	Length of—		Height of ear above notch.	Nature of specimen.
		Eye.	Ear.	Occip.	Tail.		Fore foot.	Hind foot.		
138	Matamoras	.....	.....	3.80	16.50	11.25	1.50	2.20	1.40	Dry skin
199	Lower Rio Grande	.....	.....	.....	13.00	8.54	1.50	2.10	1.30	....do
1058	City of Mexico	1.52	3.30	3.60	15.50	12.25	1.65	2.20	1.40	....do

1058. City of Mexico. John Potts.—199. Mouth of Rio Grande. J. H. Clark.—1197. Guyapuco, Mexico. Lt. D. N. Couch, U. S. A.—138. Matamoras, Mexico. February, 1853. Lt. D. N. Couch, U. S. A. (26.) Skin.

The range of this species, as shown from the list of specimens, is from Texas to the city of Mexico; how much further cannot now be determined. It probably extends into Upper California, though I have never yet seen any specimens from our Pacific Territory.

"Found on the lower Rio Grande, is not probably an inhabitant of the central part of the continent, as the Mexicans who had come down from Chihuahua had never seen such an animal. Its favorite food is the black persimmon, an abundant fruit of this region."—(J. H. Clark.)

[1] This is quoted by Waterhouse, Burmeister, and others, as described in Wiegmann's Archiv for 1842. The first mention of it by Wagner, however, appears to be in the Suppl. Schreber III, 1843.

ORDER

RODENTIA.

27. SCIURUS LIMITIS, Baird (p. 256.)—Texas Fox Squirrel.

This species is intermediate in size between *S. migratorius* and *carolinensis*, and is quite well characterized by the sparseness of hair everywhere and its compactness; features which we should expect to find in a squirrel from the warmer portions of Texas. There are but four upper molars on each side, all large. The head is broad and rather short; the septum of the nose naked. The ears appear to be unusually high, and coated equally on both sides with very short hairs, without any bushiness or tufts even at the base. The feet are less in their proportions than many other species. The claws, however, are well developed; the fourth finger is longest, the third shorter, the second reaching to the base of the claw of the third and shorter than the fifth, the first or thumb rudimentary, as usual; palms naked. On the hind feet the second, third, and fourth toes are nearly equal; the claw of the fifth reaching a little beyond the base of the claw of the fourth, the first in turn bearing the same relation to the fifth. The sole is naked from the tarsus, (or on the under side of the metatarsus,) a few short hairs only being seen near the outer edge. The inferior surface of the toes is also naked, and without any fringe projecting from the sides. Both palms and soles are dark brown.

As the tip of the tail is broken off, the exact proportions cannot be ascertained; the hairs, however, are rather short and sparse, more scanty than in any other species examined.

As already stated, the hairs everywhere are short; the longest on the back do not measure half an inch, while the average is not more than four lines. The upper parts are a mixed cinnamon and black; the individual hairs being light plumbeous at the base, then cinnamon, then black and tipped with cinnamon brown. The sides of the head, both surfaces of ears, whole under parts, and all the limbs (except the external upper portion) are of a light cinnamon brown, (not rufous,) the hairs being a little lighter towards their bases; the upper surfaces of the feet are tinged with rusty. The hairs on the under surface of the tail are uniform, and of a color a little deeper than that of the belly; those above are like the back, (the color, however, being more yellowish,) with three annulations of black; on the sides they are similarly annulated, with the sub-terminal black more extensive. There is no decided preponderance of color on the upper part and sides of the tail.

A single specimen of this species was obtained by Mr. Clark on Devil's river, or the San Pedro of the Rio Grande, Texas.

Length to base of tail, 10 inches; tail, (multilated,) —; ears above the skull, .60; ears on posterior edge, .75; fore feet from wrist, 1.08; hind feet from heel, 1.67; longest hairs of tail, 2.17; length of skull, 2.25; width of skull between zygomata, 1.30.

Notwithstanding the marked difference in color and size between this species and all the other American fox squirrels, I am far from feeling sure now that it is anything more than a local variety of the common western fox squirrel. Had I deferred characterising the species until the present day, I should hardly have ventured upon a new name without a more ample knowledge of the North American squirrels than I possessed two years ago. I only retain it now pro-

visionally, until its real character can be better tested by additional specimens. The locality is considerably further west than that of any other specimens which have fallen under my notice.

351. Devil's river, Texas. J. H. Clark. J. H. Clark.—1515. Devil's river, Texas. Dr. Kennerly.

"Of this species but a single specimen was seen, and that on Devil's river, in the midst of thick vegetation. It had here built a bed of leaves and twigs, into which it ran on being pursued. After it was forced out of this retreat, and wounded, it took to the ground and attempted to hide in the weeds and grass. This squirrel is said to be quite abundant in eastern Texas, along the margins of rivers where the vegetation is most luxuriant. Its fondness for dense vegetation doubtless explains its absence further west. Neither the bark of this nor the preceding species was heard."—(J. H. Clark.)

28. SCIURUS LUDOVICIANUS, Custis. (p. 251.)—Western Fox Squirrel.

Undoubted specimens of this species have been found in eastern Texas.

29. SCIURUS CAROLINENSIS, ??. (p. 263.)—Mexican Grey Squirrel.

In the collection of Lieutenant Couch are two grey squirrels from Santa Catarina, New Leon, which differ from the common grey squirrel of the United States in some quite appreciable points. They are smaller, with longer tail, and shorter and broader feet. The hair is coarser, above more decidedly grey and black, beneath very pure white, without any indication of the rusty line on the side of the belly, seldom if ever wanting in the more northern grey squirrels.

The skull differs from that of the common grey squirrel in lacking the small anterior upper molar, leaving but four, as in the fox squirrel. The zygoma extends further backwards, the muzzle shorter and broader. The nasal bones have their edges nearly parallel for the posterior third, instead of approaching each other gently behind.

Some skulls from San Antonio, Texas, (without skins,) agree in character with the above; one out of three has the small anterior molar.

30. SCIURUS CASTANONOTUS, Baird (p. 206.)—Chestnut-backed Squirrel.

This large and stoutly built squirrel belongs to the section with five permanent molars in the upper jaw. Of two skulls before me, one, No. 1108, shows the two anterior permanent molars just appearing, the temporary ones having been shed; the three posterior have their crowns perfectly unworn. There is also a very small rudimentary fifth anterior molar in the lower jaw, which may, however, be the remnant of the deciduous premolar. In another, No. 1107, the five permanent molars are all in place, with the crowns somewhat worn; the entire fifth molar of the lower jaw has disappeared. These skulls exhibit a somehwat greater prominence than usual of the anterior portion.

The whiskers are black and longer than the head. The ears are high and not at all tufted, although the hairs are moderately long on the anterior inflected portion. The feet are moderate; the third and fourth fingers equal and longest; the second and fifth about equal; their claws reaching the claws of the others; the thumb or first, as usual, is rudimentary. The fourth, third, and second toes are successively a little shorter, but longest of all; the fifth reaches to the claw of the fourth, and the first to that of the fifth; the soles are naked from

the tarsus, (or on the under surface of the metatarsus,) although the hairs encroach somewhat on the outer edge.

The tail is a little longer than the body. It is not bushy, but rather slender, and the hairs are not full, as in most of the other large species.

The general tint of the upper parts and sides of the body and limbs is a mixed lead color and ash grey, with some scattered black hairs. The whole back from the nape to the base of the tail is of a deep and well-defined chestnut brown; this color being not a mere dorsal stripe, but covering a space the width of the tail. The sides of the head and the ears are grizzled ash. The under parts, the eyelids, and the upper surfaces of the feet are of a rather clear white, the latter somewhat grizzled. The colors of the sides and belly are separated by a dusky line, as in the chickarees. There are some scattered chestnut hairs in the sides. The tail is entirely white and black; the central portion black above, white beneath, with white margin and tip; but all the black hairs are tipped with white. The hairs of the tail beneath are uniform white; on the sides they are mostly white, mixed with a few black ones; on the upper portion they are black at the base, then white, then black and tipped with white, the black predominating. In one specimen, however, the supra-caudal hairs are glossy black, except at their tips, which is the case in both with the hairs at the end of the tail.

Two specimens, male and female, of this species were collected by Mr. Clark at the Copper mines of the Gila, in the spring season. They were found among the pines.

Length to root of tail, 12; tail to end of vertebrae, 11; tail to end of hairs, 12.75; greatest width of tail, hairs extended, 4 50; hind feet from heel, 2.60; hind feet, naked part of soles, 2.08; height of ear above skull, .84; height of ear behind, 1.33; length of skull, 2.40; breadth across zygomata, 1.33.

This species bears a very close resemblance to *S. aberti*, and may prove to be the same, although there are apparent differences. The most striking characteristic is the absence of the beautiful ear tufts of *S. aberti*. Some of our squirrels which have smooth ears in summer are tufted in winter, but as the Copper mine specimens were caught in spring, it is not likely that they are ever tufted. The tufts, too, of *S. aberti* are long hairs growing from the very margins of the ears and project an inch beyond. The interior surface of the ear and a wooly space at their posterior bases are greyish white in *S. castanonotus*. Great differences again are visible in the tail, which in the latter is nearly pure black and white; the inferior hairs pure white, those on the upper surface and upper part of the sides are black, with white tips, greyish at the base. In *S. aberti* all the hairs above are annulated several times with dark brown and greyish white, presenting no decided impression of either color, except towards the end of the tail. The tail here is likewise much more bushy.

S. fossor is without the dorsal stripe and the dark lateral line. The tail is much fuller and more bushy; the hairs beneath the tail are finely annulated ash grey and black, without any of them being entirely white. The feet also are dark colored.

The skull of this species is of very nearly the same size with that of *S. carolinensis*, from Carlisle. Like this species it has an anterior small upper molar, making five, but this is considerably larger in the New Mexican animal, and has a central tubercle on the crown, with a lateral valley on either side, as in the spermophile. There are no other differences of importance.

The name of *castanotus*, as originally published, was a typographical error, not detected until too late, and conveys an erroneous impression in regard to the color of the ears.

121. 122. Copper mines of the Mimbres, N. M. Winter? 1857. J. H. Clark.

"This squirrel was observed in greatest abundance among the tall pines growing on the mountains about the Copper mines. Though the pilon (the fruit of this pine) at seasons constitutes its principal and almost only food, it frequents the ground; on being alarmed it seeks the largest trees, and hides itself in the topmost branches, without ever showing any disposition to leap from tree to tree. That it always sought safety in the nearest large tree when surprised led me to believe that it does not resort habitually to 'hollows," but lives and rears its young in 'nests.' Although occuring in greatest numbers in pine regions, it was occasionally met with among the oak-covered mountains about Santa Cruz."—(J. H. Clark.)

31. TAMIAS DORSALIS, Baird (p. 300.)—Gila Striped Squirrel.

Head acutely pointed; body elongated; feet and limbs moderately developed. Thumb rudimentary, with a nail; third and fourth toes and claws equal; second a little shorter than the fifth or exterior, the claw of which reaches to the base of that of the third. Palms naked. On the hind feet the inner toe is shortest; the second, third, and fourth successively longer; the fifth claw reaches a little beyond the base of the fourth. Sole naked or with a few scattered hairs; heel hairy. Claws all well developed, and clothed with bristles at the base. Tail quite short, little more than half the length of body.

This species has the lines on the sides of the face, as in other species of *Tamias*, but they are better defined than usual. Thus there is a distinct line nearly white from the snout over the eye, but not extending to the ear. A branch passes under the eye, and, extending beneath and along the base of the ear, is lost in a hoary patch behind it. A dark reddish brown stripe, mixed with black, separates the upper stripe from the crown, and another similar to it divides the lower stripe throughout its length from the dirty white of the throat and neck. A third line of the same passes back from the eye to the base of the ear, and runs up on the anterior inflected portion, where, however, it is nearly pure reddish brown.

The ears, as stated, are reddish brown on the anterior third; another third is greyish brown; the rest or posterior portion is dirty greyish white, continuous with a patch of the same behind the ear, and extending backwards for half an inch. The concavity of the ear is well covered with short hairs; brownish anteriorly, ferruginous on the posterior half.

The especial characteristic of this species is seen in the single well defined dorsal stripe of dark brown, extending from the back of the head where it distinctly separates the hoary patches already mentioned, and extends to the base of the tail. On either flank is visible a faint line of light greyish, occupying the position of the exterior light line of other species of *Tamias*. There are also the faintest possible traces of the other dark and light lines, making up the five dark and four light stripes of *Tamias*. The top of the head and upper parts generally have in general a hoary or greyish aspect, mixed with light reddish and brown; the former predominating in one specimen, the latter in another. The under parts are dull greyish white; the sides of the body, the buttocks and the exterior surfaces of the hind feet pale rusty, lighter on the fore feet.

The tail is more bushy than usual. On the upper surface the hairs are glossy black at the base, then chestnut, then black, and finally dull white; the first two colors of equal extent, about half that of the two latter. Beneath the hairs are chestnut at the base.

Two specimens of this distinctly marked species were procured at Fort Webster, Copper mines (where it is rare), in the winter of 1851.

Measurements.—Total length, 5 inches; tail vertebrae, 2; tail to tip, 3.50; hairs of tail at tip, 1.50; hairs on sides, 1.25; hind foot from heel, 1.25.

This species is readily distinguished from all others by the single dorsal stripe, the others being obsolete. The more bushy tail, with its conspicuous markings of chestnut black and white, is also highly characteristic of it.

119, 120. Fort Webster, Copper mines of the Mimbres, N. M. Winter? 1857. J. H. Clark. Skin.

"This was found only about the cañons in the Copper-mine region. It is secluded in its habits, and never wanders far from its abode, which seemed to be principally in the crevices of rocks. Once one was run into a hollow cedar; but this only proved to be a temporary or rural habitation, for, on the first jar of the tree, it ran out and made for the rocks. Aware of its presence in a certain cañon during my stay at the Copper mines, its shyness and seclusion for a long time baffled my utmost efforts to secure a specimen. I finally adopted the plan of 'lying in wait,' which proved successful in this, as in many other cases. After watching for some hours there was a shower of rain, when some three or four cautiously emerged from a crevice dripping wet; rain, being an unusual thing, probably took them by surprise. While combing their hair with their paws and licking themselves dry, one shot secured three. Piñons, cedar berries, and acorns are its food."—(J. H. Clark.)

32. SPERMOPHILUS GRAMMURUS, Bach. (p. 310.)—Line-tailed Squirrel.

125, 126. Copper mines, N. M. J. H. Clark.—? 1046. Los Nogales, Sonora. June, 1855. Dr. Kennerly.

"This very squirrel-like spermophile was observed in great numbers in the neighborhood of the Copper mines. Thence westward it inhabits the mountainous regions; its occurrence east of the Rio Grande is doubtful. Its home is between and under the strata of rock; it sometimes, however, apparently burrows directly into the side of the mountain, and to a great depth, judging from the amount of dirt brought out. On examination these holes were found to lead along the face of the rocks, probably because the soil is here looser and more easily moved.

"Several sometimes inhabit the same locality, but it is more frequently seen alone. At the Copper mines, where I had a good opportunity of studying the habits and manners of this and other animals, it seemed to select its retreat with reference to food, acorns and walnuts, for which it climbs the trees, and with great facility, but always hastily leaves them when alarmed, and flies away to near its hole, where it stops to reconnoitre. If its suspicions are well founded, it dodges in, but usually comes out again in a few minutes and returns to its labor or amusement above ground. Early in the morning or late in the evening, may most always be seen about its den, feeding or playing; about mid-day, as if following the example set by the 'lords of creation' that dwell here, it retires for a siesta. The pouches of the specimens obtained were filled with acorns in process of transportation for winter store. Occasionally one may be heard, while sitting at the entrance of his house, uttering a short, sharp note. I could never make out whether this bark was the wail of distress or the call of companionship; it always proceeded from an isolated and lonely individual."—(J. H. Clark.)

"We first observed this species (No. 1046) in the Santa Cruz mountains, and afterwards found it very common in the vicinity of Los Nogales. It seemed to make its nest indifferently in the rocks or in hollow trees, when there was an entrance about the root, but we have very seldom seen it climb the trees. In its movements on the ground it very closely resembled the common grey squirrel (*Sciurus carolinensis*), perhaps not so swift and active. It walked leisurely from point to point while searching for food, and rarely leaped and jumped like the latter, though it often paused, raised itself on its hind legs, and seemed to listen and reconnoitre. It was quite shy, and was never found far from its den, to which it rapidly fled upon the slightest appearance of danger.

"Its food consisted principally of acorns, of which there were generally an abundance in the regions where it was found."—(Dr. Kennerly.)

33. SPERMOPHILUS COUCHII, Baird (p. 311.)—Black Ground Squirrel.

338. Santa Caterina, N. Leon. April, 1853. Lt. Couch.

34. SPERMOPHILUS TERETICAUDA, Baird (p. 316.)—Round-tailed Spermophile.

1584. ♂. Fort Yuma, Cal. Maj. G. H. Thomas, U. S. A. Skin.

35. SPERMOPHILUS MEXICANUS, Wagner. (p. 319.)—Mexican Ground Squirrel.

This well kown spermophile is found probably throughout Mexico, although the Rio Grande appears to be about its northern limit. It is found as far west as the Pecos, and even at El Paso, where, however, it begins to be replaced by *S. spilosoma*, which in turn extends to the Gulf of California.

518. Pesquièra Grande, Mex. May, 1853. Lt. D. N. Couch, U. S. A. 203.—2498. Matamoras, Mex. May, 1853. Lt. D. N. Couch, U. S. A.—352. Brownsville, Tex. Feb., 1853. Lt. D. N. Couch, U. S. A.—140. Eagle Pass, Tex. 1852. A. Schott.

"This specirs was found in greatest numbers in the valley of the lower Rio Grande. It lives in the ground, and its burrow is always made with reference to the protection afforded by a thorny brush or cacti against the attacks of the coyote and other enemies. If the entrance happens to be in an exposed place, it is sometimes fortified by thorny pieces of the mesquite and cacti. Though somewhat companionable, each, as a rule, seems to have its own house. Like other mammals, it is most above ground in the morning and evening in search of food; yet it is apparently the least affected by the heat of the midday sun. It is omnivorous. Its bed is a globular mass, lined with soft material, and has but one entrance."—(J. H. Clark.)

36. SPERMOPHILUS SPILOSOMA, Bennett (p. 321.)—Sonora Ground Squirrel.

This species was first described by Bennett from a specimen obtained in western Mexico. It occurs abundantly from the Gulf of California as far east as El Paso, and even northward to Fort Stanton.

290. Chihuahua city. 1853. John Potts.—1042. Janos, Sonora. April, 1855. Dr. Kennerly.—141. ♀. El Paso. 1852. J. H. Clark.

"This species was quite common on the prairies around Janos. It lived sometimes among the rocks, but more often had its bed in piles of dirt heaped around the base of some bush. These piles were elevated several feet above the surrounding ground, and were entered by three, four, or more apertures near its summit. They were exceedingly shy, and a specimen was procured with difficulty."—(Dr. Kennerly.)

37. CYNOMYS LUDOVICIANUS, Baird (p. 331.)—Prairie Dog.

The well known prairie dog is an inhabitant of the central portions of the United States, from the Upper Missouri region to the Rio Grande. It has not yet been found west of the Rocky mountains, unless a young animal, possibly of this species, collected by Dr. Kennerly between Janos and San Luis Spring, may be considered as indicating this fact.

1054. Devil's river, Tex. Dr. C. B. Kennerly.—1035. ○. San Luis Spring. April, 1855. J. H. Clark.—161. Limpio Mts. J. H. Clark.—498. San Antonio to El Paso. J. H. Clark.

"This animal is well known under the name of 'prairie dog,' and as almost the only inhabitant of the high dry prairie land, destitute of every form of vegetation except grass. The pursley (*Portulacca*) is a favorite food; in the most populous parts of their towns, after having eaten up the grass to the very roots, they migrate to a more verdant spot. In extensive towns of old standing there is sometimes scarcely a sprig of grass to be seen for miles. They prefer the depressions or hollows in the prairies, partly because of the greater amount of vegetation in such places, but also because of the reservoirs of water that are probably collected here. When the water has wholly evaporated, or sunk below their reach, as sometimes must be the case, the succulent roots supply its place. Whether the result of instinct or a rational deduction, their habit certainly comes under the motto of 'early to bed and early to rise;" for little is seen or heard of them after sunset; and before sunrise they are seen in great numbers and all sizes, feeding, chasing each other, or sitting on their haunches; they frequently assume this latter position when approached. As the sun heightens and it becomes hot they disappear in their burrows, till, in the heat of the day, there is scarcely one to be seen. When it rains they come out in great numbers, pile dirt around the entrance to their holes, which are sometimes completely covered over, presenting the appearance of a dutch oven in minature. In closing up their burrows, they mix grass with the mud and work from the inside after it is nearly completed. There is no doubt that this is done with the object of securing themselves against the water that may collect or run through the depressions in the prairie which they inhabit. once witnessed, near Presidio del Norte, the 'drowning out' of a small town by a sudden and heavy

shower; some swam to the high ground, many were drowned, and not a few fell a prey to the coyote. Several were taken alive and kept a month; they were fed on purslely, of which they ate voraciously; they also drank water freely. Most of the time, however, they lay on their bellies in a sort of stupor, with their nose and feet drawn together. A prairie dog is always fat; and, under some circumstances, may be considered good eating; which, being deposited in a comparative great quantity between the skin and muscle, renders the skinning a tedious operation. Their burrows, at first either nearly perpendicular or slightly inclined for a few feet, lead off in various directions; their extent I was never able to ascertain. Half a dozen or more will at times run into the same burrow; yet they will pass, even when hotly pursued, very eligible habitations externally, showing, though eminently social, that each has his own house. In all discussions of the prairie dog it has been universally associated with the owl and the rattlesnake, and for no very good reason that I see. The rattlesnake is found in other localities just as abundant as in dog towns; and if one is seen in or about a burrow, a close examination is very apt to disclose a spider's web across the entrance, indicating that the rightful occupant has been frightened off or devoured. The owl is undoubtedly an interloper, using its neighbor's house as a convenience, and possibly feeding upon its young; its proximity, however, gives the dog no uneasiness, and both inhabit the same burrow at the same time."—(J. H. Clark.)

"This interesting little animal, about which so much has already been written, and its habits so closely studied and accurately described by many naturalists, never fails to attract the attention of every traveller on the western prairies; and an approach to one of their settlements, after long and dreary marches, is always hailed with delight as a pleasant change from the monotony of lifeless scenes to one of cheerful activity and motion. Such occasions never fail to excite a certain degree of pleasure in every one, as he watches the motions of these curious creatures as they at first assemble in numbers as if in grave consultation in regard to the intrusion of strangers upon their quiet domain, and, upon the too near approach of apparent danger, suddenly the assembly is dispersed, each one retiring to his respective home, and, standing upon the edge of his den, utters his peculiar bark, as if in defiance; and then every one disappears suddenly, and every voice is hushed when a single gun is discharged.

"These settlements or 'dog towns,' as they are called, are of frequent occurrence between Devil's river, of Texas, and the Rio Grande, some of them covering many miles of country. West of the latter stream we observed them as far as the Sierra Madre. We visited the San Luis valley in the month of May, where there was a very large extent of country covered with their burrows. Here we procured a young one, which was probably a week or two old. We were attracted to it by a low whining noise which it made, not unlike that of a very young kitten. It was found on the surface, and was so young and feeble that it did not attempt to escape when approached. Having taken it to the camp, we placed it with a bitch, which had pupped but a few days before. By holding it in our hands it sucked with great earnestness, and we much hoped thus to be enabled to rear it and tame it; but after some days it sickened, and, refusing to take farther nourishment, soon died. After leaving this valley, in travelling westward, we did not again observe the 'prairie dog.'"—(Dr. Kennerly.)

The prairie dog of the Americans; perrito del campo of the Mexican; tlui of the Apaches.—This singular animal is known to all western travellers, but there are some features in its history still left to be elucidated. Do they wander, and, if so, is it in a certain direction? If they remain stationary, what do they live on? Are the rattlesnake and the smaller ground-owl (*Athene hypugaea*) constant house-mates of the prairie dog? If so, what object makes such heterogenous animals live together?

There are not yet enough data on record to answer these questions conclusively; on the contrary, every attempt to do so proves only how little we know about them. That the dog towns should be entirely permanent seems to be an entire impossibility, for the destruction of vegetation, which such a marmot settlement causes all around, is so complete that nothing is left within the limits of it on which these animals could depend for any length of time.

"From what I have seen of these marmot settlements, I believe that, after one stretch of soil is used up, an adjacent portion on either side is taken possession of. The social character of the animal causes this to be done *en masse*, and thus the town will be extended in some direction. It seems not probable hat the prairie dogs abandon their settlement entirely; this is at least not corroborated by careful examination. Their burrows are the only defense these animals have, and therefore they never dare leave them at a great distance. They want their holes near by where they feed. Long drought and sterility favor the extension of their towns."—(A. Schott.)

38. CASTOR CANADENSIS, Kuhl (p. 355.)—American Beaver.

This well known species was found in abundance on the Rio Grande of Texas and the Colorado river of California.

1337. Colorado Bottom, Cal. A. Schott.—1003. Upper Rio Grande. J. H. Clark.—1415. Matamoras, Mex. Dr. Berlandiere. Skull.

The beaver; pen of the Yumas; pin of the Cocopas.—The abundance of this species on the Gila, but especially on the Colorado del Oeste, makes it a very prominent feature in the fauna of the country. On a reconnoisance down the latter river to its mouth, we passed miles and miles of river banks, which are inhabited, fortified, and covered over by the labor of this singular animal.

We had, however, no opportunity of observing any of that celebrated, almost miraculous, regularity and ingenuity with which, according to general belief, the dens and dams of the beaver are constructed.

Like the aerial nest of the Colorado tree rat or the amphibiously placed stronghold of the muskrat, the beaver's dwelling-place forms also a chaotic heap of drift wood, rush, and mud.

In those nests which have come under our eyes, only one hole communicating with the out and inside could be observed. Whether there are more, and especially sub-fluviatile openings, I am not able to say, though I doubt it, according to what I have seen of beaver life. Of that celebrated ingenuity and those architectural efforts of the beaver I could not learn any particulars. All the skill exhibited in erecting and locating those huts prove but a certain amount of instinct, of which many other mammals possess a similar share, and in which especially birds and insects are far ahead.

The most elevated point on our boundary line where beaver life came to our knowledge is the Guadaloupe cañon, (Sierra Madre,) about 5,000 feet above salt water. The lowest beaver habitation was seen by ourselves, about 30 miles above the mouth of the Colorado, where the last timber gives way to those unbounded cane-brakes and salt marshes which border the head of the Californian Gulf.

39. GEOMYS CLARKII, Baird, (p. 383.) Pecos Gopher.

This species thus far has only been found near Presidio del Norte and on the Pecos river, where several specimens were obtained.

6. Presidio del Norte. Major W. H. Emory. Skin. J. H. Clark.

40. THOMOMYS UMBRINUS, Baird, (p. 399.)—Sonora Gopher.

If I am correct in the identification, this species was first described from a specimen collected at "Cadadaiguias, Louisiana," a locality of which I can at the present day find no trace. It appears to be quite abundant in New Mexico and Sonora, although its precise range is not yet well ascertained.

154. Fort Webster. J. H. Clark. Skin. J. H. Clark.—149. Santa Cruz, Sonora. Skin. J. H. Clark.—1036. Espia, Sonora. Skin. Dr. Kennerly.—?1331. Santa Isabel, California. November 26, 1854. Skin. A. Schott.

"Though traces of this animal may be often seen in the alluvial soil of the mountain valleys in northern Mexico, it is very inconspicuous itself, being nocturnal. It seldom exposes the whole of its body above ground in daylight. On coming to the surface, if the grass is sufficiently near to be reached, it seizes a sprig and drags it within the entrance, and with its fore feet packs it away in its pouches; when this operation is completed, the opening is filled up with loose earth, which has been aptly described by suggesting its resemblance to the "emptied contents of a flower-pot." If there is no grass near its opening, it will sometimes come entirely out, when it can be easily bewildered and captured. The surface gives way under the foot where the pouched rat has been at work; it is not the species, however, that burrows so extensively in the prairie and piles up the large hollow mounds, the cause of many an inward curse to the inexperienced traveller "[1]—(J. H. Clark.)

"This animal had its hole on a grassy spot on the bank of the Corralitas river. For several successive mornings before sunrise it was observed to come cautiously out to gather grass and roots, and carry them into his den, never, however, venturing more than a few feet from the entrance. It seemed always to be uneasy and apprehensive of danger, and at the slightest noise or motion on our part it immediately disappeared, after the lapse of some time returning, first protruding its head and reconnoitering. When it was killed its pouches were filled with grass, but the manner in which it was put there could not be seen. The hole in which it lived was perfectly smooth, and did not go straight down, but inclined considerably, and apparently did not extend far beneath the surface. Near by was a pile of dirt which had probably been removed from it."—(Dr. Kennerly.)

41. THOMOMYS FULVUS, Baird, (p. 402.)

This species was first obtained by Dr. Woodhouse in the San Francisco mountains of New Mexico, and appears to be confined to the regions west of the Rocky mountains.

1330. Fort Yuma, California. January 2, 1855. A. Schott.

[1] These remarks may possibly apply to the *Geomys clarkii*.

"The specimen of our collection was obtained on the sandy banks of the Colorado, not far below Fort Yuma. I found it slowly moving upon the drifting sand between the river thickets formed by willows, cotton trees, bacharis, and tessaria. As it did not seem to notice much my approach, I concluded that this animal must be weak-sighted in daylight and probably nocturnal in its habits."—(A. Schott.)

42. DIPODOMYS ORDII, Woodhouse, (p. 410.)—Kangaroo Rat.

This species was first described by Dr. Woodhouse from specimens collected at El Paso, the same locality as that of the boundary collections.

560. El Paso, Texas. J. H. Clark.—1044. Mesilla valley. 1855. Dr. Kennerly.—143. Santa Cruz, Sonora. J. H. Clark.—372. Durango, Mexico. Dr. T. H. Webb.

"This species inhabits loose or sandy soil habitually, where may be seen piles of dirt of an oval shape scattered here and there, each of which would fill a cart. These heaps of dirt are hollow, and have several entrances about the base, which are much larger than the animal. Sometimes, after the habitation seems to be completed, the dirt is brought out of these holes and deposited at a distance of several yards. Their labor is done almost entirely at night, and they are but seldom seen by daylight. The piles of dirt readily give way under the foot, and a mule or horse will shrink from them with as much fear as they do from a rattlesnake. I could never succeed in frightening out the occupants by running sticks into the entrances or knocking the heaps in. Rattlesnakes are often seen in the holes, which form a constant and secure retreat for all the lizards."—(J. H. Clark.)

43. DIPODOMYS AGILIS, Gambel, (p. 414.)

It is with some hesitation that I refer the specimens collected by Mr. Schott to this species, as they are too young to furnish any very satisfactory indications.

1348. Fort Yuma, California. In alcohol. A. Schott.

44. PEROGNATHUS PENICILLATUS, Woodhouse, (p. 418.)

1332. Colorado river. February 22, 1855. A. Schott.—1333. Fort Yuma. A. Schott.—Colorado desert. In alcohol. A. Schott.

45. PEROGNATHUS HISPIDUS, Baird. (p. 421.)

Of this species several specimens were collected at Matamoras, and it probably extends further north into Texas.

577. Charco Escondido, and 576. Matamoras, Mex. Lt. Couch.

46. PEROGNATHUS FLAVUS, Baird. (p. 423.)

This species is found quite abundantly throughout the west, from the lower Rio Grande to El Paso, and a considerable distance westward. It also extends through the Rocky mountains to the Missouri river.

1043. San Antonio to El Paso. Major Emory. In alcohol. Dr. C. B. Kennerly.—1041. El Paso to Los Nogales. In alcohol. Dr. C. B. Kennerly.—148. El Paso. 1851. Col. Graham. J. H. Clark.—2623. Chihuahua. Dr. T. H. Webb.

47. MUS TECTORUM, Savi. (p. 441.)—White-bellied Rat; Roof Rat.

Of this species of rat, specimens were collected at Cadereita, New Leon, by Lt. Couch, and skulls, apparently of the same species, are in the Berlandier collection from Matamoras.

"The people of the neighborhood of Fort Duncan talk of a three years' cyclus, during which the appearance of hundred thousands of rats is repeated once. According to the description given to me, I think the animal to be of the species above mentioned.

"Some of the soldiers who had been engaged in making the excavations for the groundworks of some of the buildings during one of these 'rat years' told me that they could easily kill every morning from thirty to forty of these rats, which had descended or tumbled down into these diggings without being able to scale again the vertical walls.

"According to further statements these animals seem to disappear again suddenly, after which hundreds and thousands can be found lying dead over the surrounding table lands. The decaying matter then renders the infected atmosphere almost insufferable."—(A. Schott.)

48. REITHRODON MEGALOTIS, Baird. (p. 451)

Sp. Ch.—Largest of North American species. Head and body from 2.50 to 3 inches; tail about two-tenths shorter. Hind foot near .70. Ears large, moderately clothed with hair. Above mouse gray, lined with darker, and tinged with rusty; on the rump and sides a fulvous wash. Beneath soiled yellowish white.

Two specimens of *Reithrodon* were collected by Dr. Kennerly between Janos, Sonora, and San Luis spring, which I cannot readily refer to any of the described North American species. In size they exceed any of their congeners in the United States, being nearly as large as a *Hesperomys*. The ears are conspicuously large and broad, projecting far beyond the fur. They are not so thick as in *R. montanus*, and not quite so thickly clothed with hair; more so than in *R. lecontii*. The hind feet are moderately long; soles hairy to the first tubercles. The tail is about as long as the body, exclusive of the head; it is well clothed with hairs, concealing the annuli.

The upper parts are somewhat of a mouse color, lined with darker, and with a rusty tinge on the rump and sides; this is tinged with fulvous. The under parts and feet are of a soiled yellowish white. This animal has a much shorter tail than the California species. The ears are considerably larger than in *R. montanus* and *lecontii*.

1039. Janos to San Luis spring. Mounted. Dr. Kennerly.

49. HESPEROMYS TEXANUS, Woodhouse. (p. 464.)

This species is so closely allied to the *H. leucopus* as to be distinguished with difficulty.

?145. El Paso, Texas. Col. Graham. Skin. J. H. Clark.—1037. Turkey creek, Texas. Nov., 1854. Major Emory. Dr. C. B. Kennerly.—579. Charco Escondido, Mex. Lieut. Couch. Skin.

"In passing through a groove of live oaks (*Quercus virens*) in the valley of Turkey creek, late in the afternoon, we observed near the top of one of the trees a nest built of leaves closely resembling those sometimes constructed by the common Carolina squirrel. Being desirous of ascertaining whether there was any animal in the nest we discharged our rifle at it, which resulted in the two mice presented being dislodged from it. We knew of no reason why, in this locality, they should have abandoned the usual habits of their kind, and selected this position instead of building their nest in the ground, under stones, or in old logs."—(Dr. Kennerly.)

50. HESPEROMYS SONORIENSIS, Leconte, (p. 474.)

144. Santa Cruz, Sonora. 1851. J. H. Clark.—9. El Paso, Texas. J. H. Clark.

"This animal seems to live, as circumstances may determine, either in the ground or in the hollows of trees. A specimen obtained from a 'hollow' of a cottonwood tree had a snug bed made of the fine filaments or inside bark; in this there was apparently no provision made for a family, or even for a companion. This seclusion is not probably peculiar to the genus but only the freak of a disgusted or selfish individual.

"This, or an allied species, builds globular beds of fine grass, lined with feathers and other soft material, on the Opuntia and other chapparel. They are quite numerous in some sections, and, seen at a distance, hanging on thorny branches, resemble old bird nests. The entrance, usually at the side or bottom, is, to all appearance, so entirely closed as to suggest the question, by what built, and for what purpose is such a contrivance? I never saw one in an unfinished state, nor the animal at work—labor is perhaps performed after night."—(J. H. Clark.)

51. HESPEROMYS EREMICUS, Baird (p. 479.)—Desert Mouse.

This strongly marked species has hitherto only been found at Fort Yuma and its vicinity.

1334. Colorado Bottom, Cal. A. Schott.

52. NEOTOMA MEXICANA Baird (p. 490.)—Bush Rat.

1033. San Pedro R., Sonora. Dr. Kennerly.—1328. ♂ Colorado bottom, Cal. March 31, 1855. A. Schott.

"The only specimen of this species observed by me was procured near the San Pedro river on a bluff, where it had built its nest among the rocks. Evidences of its presence were perceived in great quantities of excrement around the spot; and, after removing a few stones, its nest was found, and the animal easily captured. The nest was composed of a compact bunch of dry grass.

"The food of this animal consists partly, perhaps, of the cactus and its fruit, which grew in abundance in this locality."—(Dr. Kennerly.)

"*Raton of the Mexicans; Dzgonce, of the Apaches; Amalj, of the Yumas.*

"This animal is most common in the bottom lands of the Lower Colorado, and most probably in corresponding localities on the Gila.

"It builds its domicile between the forks of mezquite trees, the deflexed ramifications of which usually form a natural defence against larger intruders. The nest itself is made up of dry sticks, such as the ground underneath such trees is strewn with There is no regularity in the construction of this house, which resembles, on a smaller scale, those of the beavers. The only difference is, that the rat builds his house above freshet-mark. As a common inmate of those rat nests is also a *Sceloporus*, perhaps, *Sc. collaris*, which has its entomophagous sports upon the rough bark of the mezquite tree. Thus the rat and the lizzard live peaceably together.

"The principal food of this rat seems to be the pods of the mezquite and the screw bean, of which often large depositories can be found in their strongholds.

"The animal seems to avoid carefully any contact with water, and therefore likes to build its nest above the reach of water. Being obliged to live for some months on deposited food, its habitation necessarily must remain perfectly dry.

"For the Indians, Yumas and Cocopas, living in the Colorado bottom, this tree rat is of some importance. As they do not hunt, they depend on the meat of this rat for that small portion of animal food they want. In spring, that is, in February and March, the rat nests are carefully searched by the Indians. It was in this season that when, after some of us had refused the offer of an Indian to sell us some of this delicacy, he assured us in his peculiar Indian-Spanish, 'mucho bueno por comer;' and then went to my camp-fire, and, after killing one or two of his long-tailed prisoners, placed it, without any cleaning, into hot ashes. After a quarter of an hour the dish was ready, and required only a little salt to make it palatable to the native consumer."—(A. Schott.)

53. NEOTOMA MICROPUS, Baird (p. 492.)—Black Wood Rat.

554. Charco Escondido. Mexico. 1853. Lt. D. N. Couch.—561. Santa Rosalio, Mexico. Lt. Couch.

54. SIGMODON BERLANDIERI, Baird (p. 504.)—Texas Cotton Rat.

8. West of San Antonio. Skin. J. H. Clark.—233. Eastern Texas. Skin. J. H. Clark.—2682. Ringgold Barracks. A. Schott.—1034. Los Nogales, Sonora. Dr. Kennerly.

"It sometimes inhabits the vicinity of water courses, seeking the tufts of grass usually growing here as a place of retreat. It also burrows into river bluffs and banks of ravines; its burrows, however, are more properly some sun-cracked crevice or water-washed hole, which is apparently selected at times with reference to some adjacent rank vegetation. Sticks, feathers, and other foreign matter are collected about its habitation, which is otherwise marked by clean and well beaten paths, sometimes forming a sort of tunnel through leaves and fallen weeds and grass. Like the Norway rat, it seems to be omnivorous, and is a day as well as a night feeder. The specimens obtained were shot as they skipped from one cover to another."—(J. H. Clark.)

"This species was quite common at Los Nogales, but we did not observe it in any other locality. It lived in the ground, in the immediate valley of the stream where the soil was of a soft alluvial character. It frequented the places occupied by the cooks, and its depredations often amounted to annoyances. It was not entirely nocturnal in its habits, but frequently made its appearance during the day time, and was not very shy."—(Dr. Kennerly.)

55. FIBER ZIBETHICUS, Cuv. (p. 561.)—Musk Rat.

No specimens of this species were collected by any member of the commission.

"During my whole journey along the boundary line I only saw one specimen of this interesting genus. It was killed in the low marshes of the Gila, near Fort Yuma. The ball had taken off the animal's head entirely.

"To conclude from the number of tracks we saw on the Gila and Colorado, and also on the Rio Bravo, the Ondatra cannot by any means be rare.

"In one nest which we accidentally opened in the bottom of the Colorado, and supposed to be the habitation of a musk rat, we found a large store of screw beans, on which the animal seems to feed in winter time."—(A. Schott.)

56. LEPUS CALLOTIS, Wagler (p. 590.)—Jackass Rabbit; Texas Hare.

SP. CH.—Size large; limbs very long. Ears much longer than the head. Fur variable; fuller in winter and on high table lands, thinner in summer. The dorsal region mixed reddish yellow or light cinnamon and black; the hairs grayish white at the base; sides and fore part of chest and throat paler, with much less black; buttocks, sides of the rump, and external surface of hind legs ash gray, finely and faintly lined with dark brown, which, on the buttocks, appears arranged in lines somewhat parallel to the outline of the longer fur of the back; upper surface of the tail, with a line on the rump, black; rest of the tail ash gray; beneath, smoked white. Ears, with the posterior edge, white; this color also visible on the interior face of the ear, except the external band, which, with the internal, is grizzled pale cinnamon yellow and brown; end of the ear with a brown edge corresponding to a dark terminal patch on the dorsal surface. Nape and neck above either black or grayish; in the former case the base of the ear behind is dark brown; in the latter it is white.

No. 252.—Body long and slender; limbs very long, ears very long, much longer than the head; tail of moderate length; legs slender, the fur compact and short; claws very long and sharp, nearly straight, projecting beyond the pads.

General color of the back a light brownish yellow, with a slight shade of cinnamon varied with black, somewhat similar on the sides, but paler, with less admixture of black. The nape is dark sooty brown. The upper chest and throat are dull brownish yellow; the sides of the rump and buttocks, the tibial region all round, and the outer surfaces of the fore legs, light ashy or bluish gray, finely and faintly marked with parallel lines of black, caused by the black tips of interspersed hairs. The tail is ashy white beneath and on the sides; black above, the color running up on the rump for two inches. Inferior surface of the body, anterior face of the hind feet, posterior edge of the fore legs, and the inferior surface of the head, white, with a tinge of smoky; most decided exteriorly and on the inside of the thighs; a whitish spot on the top of the head; the pads of the feet light dull brownish yellow. The internal and external bands of the ear are pale brownish yellow and black, finely mixed; the external fringe and the remaining portion of the outer surface of the ear, or its concavity, is unicolored brownish yellow, darker towards the top. The posterior edge is yellowish, or creamy white, except for about half an inch from the tip, which is dark brown. On the posterior surface or convexity the ear is sooty brown for half an inch from the tip (not on the external band) and at the base, the

color extending on the posterior edge of the latter, or for nearly two inches. Of the remaining portion, the inferior half is pale fulvous, shading superiorly into ashy.

On the back the fur is light ash gray at the base, then black, then brownish yellow, and finally tipped with black. On the lower part of the sides the black changes into a light brown. On the posterior portion of the dorsal surface, the bases of the hairs on the median region are lead color; more laterally this becomes lighter, and the dorsal portion nearly white. The grey hairs on the buttocks are much shorter and more compressed than the adjacent region of the back.

A specimen, No. 135, collected at Eagle Pass, Texas, by Mr. Schott, in the summer of 1852, agrees in every respect, except in having the back of the neck entirely destitute of the dusky brown of the one first described. This is of a brownish yellow, the color showing on the base of the ear. The black annulation of the fur above is less extended and less intense. The ears are more cinnamon in tint, and the black at tip is a little greater in extent. The legs appear a little thicker and the pads fuller, the claws not quite so long and sharp; the ears are no longer in proportion.

No. 184, likewise collected by Mr. Schott, at Eagle Pass, agrees with No. 252 in the dusky nape and the black base of the ears. The black on the back is, however, more like No. 135, or less distinct than in 252, and the fur on the anterior portion of the back is more dusky at the base. The claws are shorter, the pads rather fuller, and their color much darker, or a dirty reddish brown.

A specimen from Northern Mexico, Charco Escondido, collected in the spring of 1853 by Lt. Couch, U. S. A., bears a close resemblance to No. 252; but the ears are much longer in proportion, as will be seen from the table of measurements. The colors above are clearer, the brownish yellow lighter, the under surfaces of the feet darker; the tail, too, is rather longer; no other differences discernible. The nape and base of ears are dusky black.

A single pair of ears from Mr. Jennings, Austin, Texas, are larger than those of any specimen examined. I can detect no special difference from the others, except that the colors are purer, the black at the end of the ear covering an inch and a half from the tip, the inner surface, except the external band, pure white to the base.

Thus far, no specimens received in Washington seem to correspond to the *Lepus texanus* of Aud. and Bach. The characteristics of the specimens above described cover those of *L. texanus* to some extent. It will be seen that specimens with black napes have the ears varying by an inch, the largest nearly six inches. All have black tips to the ears, of greater or less extent, although authors give the black ends as peculiar to *L. californicus* and *texanus*. Specimens with the ears of the same proportional size have black napes or gray. The nearest approach to *L. texanus* is seen in a scalp with ears, brought from Red river by Capt. Marcy. Here the colors are more rufous than in any of the others; the nape is pale rusty; the base of the ear white; the tip brownish black, except on the external band. The ears measure 5 inches 2 lines posteriorly, and 4 inches 3 lines from the notch.

A young specimen, collected at Charco Escondido by Lt. Couch, has much the same distribution of color above as the adult. The fur, however, is fuller and brownish lead color at the roots, then brownish rusty, then black, then reddish yellow; some of the hairs, in addition, have black tips; towards the sides the base of the hairs becomes lighter. Upper part of tail

and rump, black; abdomen, beneath, pure white, like cotton; beneath the head and anterior surface of hind feet grayish white; inner surface of the limbs ashy gray; the neck beneath rusty gray. Pads of the feet bright brownish red. Nape dusky, much as in the adult, but the colors less bright.

Total length, 11 inches; ears, two inches 2 lines, but little longer than the head; hind foot, 2 inches 9 lines.

Measurements.

	No. 252. Brazos, Tex. Black nape.	No. 135. Eagle Pass, Tex. Gray nape.	No. 134. Eagle Pass, Black nape.	No. 299. Charco Escondido. Bl'k nape.	Llano Estacado. Gray nape.	Austin, Tex.
To base of ears	4.00	4.25	3.83	4.08	.....	.....
To base of tail	21.75	24.50	19.50	19.75	20.00	.....
Tail to end of vertebrae	1.58	1.75	Broken.	2.25	2.25	.....
Tail to end of hairs	2.75	2.83	Broken.	3.25	3.17	.....
Ears posteriorly	5.17	5.42	4.83	5.83	5.25	6.25
Ears anteriorly	4.75	5.07	4.50	5.58	.....	.....
Ears above notch	4.00	4.58	4.25	4.93	4.75	5.00
Fore arm	5.00	.....	4.17	.....	.....	.....
Fore foot	2.25	2.93	2.17	2.17	.....	.....
Tibia	5.25	5.83	.....	.....	.....	.....
Hind foot	4.58	4.58	4.58	4.58	4.75	.....

"The 'jackass rabbit,' so called because of its great ears, is the only mammal, excepting the wolf, that occurs abundantly on the naked prairies. It is easily put up, for it usually seeks no other protection or hiding place than a little scratch in the ground in the shade afforded by some stunted bush. Does not squat so readily as the *Lepus virginianus*, and never burrows for protection like *L. Artemisia*. In certain sections, during the winter, the coarse and stinking creosote plant constitute almost its only food. Its subsistence on such diet is evidence of its hardihood, and proves its capability of existence where most animals of its kind must perish. The traveller is at times glad to obtain it for food; yet its flesh is hard and dry, and sometimes highly, but not always pleasantly, flavored. Its great swiftness prevents it from falling an easy prey to wolves. I on one occasion saw this rabbit pursued by some large hawks; they seemed to be wary of their power to capture it, and did not attempt to seize it while in my sight. In plazas and other places, well beaten paths indicate the favorite haunt or play ground of this timid but watchful animal. When suddenly started up, especially if it is much frightened, its body is brought into a semi-circle, with ears laid close back, and its vigorous leaps are continued in one direction but a few hundred yards; it thus overcomes space under great disadvantages; its course, ordinarily even, is very zig-zag. If going at an easy jump its ears are thrown forward, reminding one of the flapping appendages of its prototype, jackass, unless endangered by the thorny vegetation; its prodigious leaps, which clear it of most of the flora in its habitat, however, save the trouble of any especial care in this respect. The contrast of color—black and white—about its tail and head is quite decided when running from you, the position in which it is usually seen. Its skin is as tender and it is as easily killed as other hares. It brings forth but two or three young at a time, and not till late in summer, so far as my observation went."—(J. H. Clark.)

57. LEPUS CALIFORNICUS, Gray (p. 594.)—California Hare.

One specimen of this species was collected on the lower Colorado river of California, by Mr. Schott.

58. LEPUS SYLVATICUS, Bachman (p. 597.)—Gray Rabbit.

A specimen, probably of this species, was collected at Indianola, Texas.

59. LEPUS ARTEMISIA, Bachman (p. 602.)—Sage Rabbit.

This species is abundant through Texas and New Mexico.

315. San Antonio to El Paso. J. H. Clark.—1417. Matamoras. Lt. D. N. Couch.

"Wherever the thorny clumps of chapparal and the loose sandy soil afford protection to this smallest of rabbits, it may be found in great numbers. No matter when or where one of these may be seen, a clump of chapparal or its burrow seem always at hand; thus it does not travel far, and a few jumps brings it to a place of safety. Notwithstanding this, it forms the principal animal food of the coyote. The burrows usually run into sand hillocks formed around bushes; sometimes, however, they are dug into the bare compact surface. Both this species and the *Callotis* seem to be lean in all localities, and under all circumstances, never having seen a specimen of either showing a deposit of fat around the kidney, so common on the *L. virginianus*, in fall. As an article of food it is superior to the *Callotis*, but not equal to the common hare; and on the lower Rio Grande, a region fertile in game, where it is particularly abundant, the people do not think it even worth the knocking over with a stick."—(J. H. Clark.)

60. LEPUS BACHMANI, Waterhouse (p. 606.)—Bachman's Hare.

Specimens of this species were collected at Brownsville, Texas, by Lt. Couch and Capt. Van Vliet.

61. DASYPUS NOVEM-CINCTUS, Linnaeus (p. 623.)—Texas Armadillo.

Sp. Ch.—Tail as long as the body, exclusive of the head. Shell of the back a little wider than long. Eight movable rings in the middle of the shell, and a ninth partly free on the sides. Tail covered with jointed whorls for its basal portion; the terminal third plated but not sheathed. Color blackish. Molars 32.

Description of a young specimen in alcohol.—The head is very much rounded at the vertex, but produced into a rather narrow truncated muzzle, the sides of which, viewed from above, are concave; the upper outline nearly straight from behind the eyes to the tip. The ears are broad, long, obtusely acuminate, and situated entirely on the occiput, their bases in contact. They are barely less than half the length of the head. The eyes are small; considerably nearer the occiput than the nose. The nostrils are entirely terminal, horizontally crescentic, the concavity superior; the broad truncated muzzle, with the nostrils separated by a rather wide septum, resembles very closely that of the hog.

The legs are very strong; the anterior projecting from the body quite as much as the posterior, and of equal thickness. On the fore feet there are four fingers without the slightest rudiment of a thumb; the toes very short; scarcely projecting in any of the feet beyond the thickened skin. The two central fore claws are much largest; the inner and outer much smaller and equal; the former more posterior, not reaching the base of the adjacent claw. The hind claws are rather shorter; the third longest; the second and fourth equal and opposite; the first and fifth also equal and opposite, and considerably further back. The tail is long, and tapers regularly to an acute tip; it is as long as the body, exclusive of the head.

The entire body is covered with tessellated bony plates; those on the back arranged in sheets, which come low down on the sides, but do not extend on to the belly. Of those there is one continuous sheet on the anterior third of the body, cut out so as to fit round the back of the head; the middle third is occupied by eight half rings, nearly equal to each other; and the posterior third is again covered by a sheet of plates extending to the tail, and fitting down over the rump and thighs. The connexions between these sheets and rings are formed by a skin covered with minute tessellations, and permitting free motion. In addition to the eight rings described, there is a slight indication of a ninth posterior one, which, however, only becomes

free and open on the lower part of the sides. The tail is enveloped in whorls of plates, of which twelve may be counted from the base, each one composed of two or three single whorls or annuli between successive joints, the posterior one with the plates more elongated; after this the plates become imbricated, as in a plaited whip lash, without special joints. The plates on the top of the head are sub-hexagonal, and of nearly equal size. Those on the shoulders and rump are rounded, and chiefly arranged so that one larger plate is surrounded entirely by smaller ones; the plates on the rings are narrowly elongated triangular, the apices and bases of the triangles alternating.

As stated, the entire exterior of the animal is covered with plates; those on the ear smallest; the under and inner surfaces are covered with granulations, arranged in transverse series. A good many short stiff scattered hairs are seen to project from the under surface, as well as from the edges of the sheets and annuli above.

In five specimens before me from Texas, three very young and two adult, there is a very great constancy in the arrangement of the rings on the middle of the body; of these, eight separated narrow ones are visible on the middle of the back, and nine when counted on the side. In a shell from Brazil, (2,195,) the breadth is greater in proportion, and there are nine separated annuli above. The sculpturing also is slightly different. It is not at all impossible that a careful comparison of perfect specimens from Texas and South America may reveal specific differences.

The skull has eight molars in each side of each jaw, or thirty-two in all.

The nine banded armadillo has thus far been found to occur in the territory of the United States only on the Lower Rio Grande, although extending southward through Mexico, and if identical with South American specimens, into Brazil and Paraguay.

2859. Matamoras, Mexico. Lieut. Couch.—230. Lower Rio Grande, Texas. J. H. Clark.

"The inhabitants of the former Spanish colonies know the tatou commonly as the *Armadillo* or *Encubierto*. The people of the country esteem its flesh; and the women attribute imaginary properties to its shell. This animal is mostly nocturnal in its habits, rarely going out by day, near the settlements, except to search for food. It delights to dig large holes in the earth, where it conceals flesh and vegetable substances. A viscous and transparent humor almost continually drops from its mouth. This edentate is naturally stupid. It is gifted with extraordinary strength, and when it has once taken hold in its burrow, it is more easily torn to pieces than pulled out.

"I have sometimes seen these animals elevate a weight placed on their backs of almost a hundred pounds.

"As the movements of this animal are very awkward, it seldom escapes the hunter who pursues it on the open plain; but in the mountains it rolls itself up, and thus transformed into a ball, on a declivity rapidly disappears, rolling over the stones.

"A specimen of which I made a description was kept two or three months in our house. It frequented the kitchen, where it lived on the refuse; and if it came out sometimes in the day from its den, which it had dug in the earth, it was not long before it returned again to it.

"At will this animal can entirely conceal its head between its legs, as when it sleeps or when it is attacked."—(Berlandier)

"The occurrence of this animal any distance east of the Rio Grande is probably unknown, nor is it found higher up on this river than the vicinity of Ringgold Barracks. It lives mostly in and about the banks of the river and the many lakes or old river beds. It sleeps, for the most part, during the day, so drawing itself up that all of the few vulnerable parts are completely protected by its armor. Among the inhabitants it is much sought after as food, and is considered a delicate dish. Its flavor is similar to that of the "possum;" but less fat, more delicate, and altogether more palatable. It is inoffensive, has a gentle disposition, and can be handled with impunity. Once in the hands of its captor, it will play possum, allowing itself to be carried leisurely by the tail, so that an unexpected and spasmodic jerk, such as it only is capable of giving, will release it from the most vigorous grasp, particularly if there is any support for its feet. So rapid and vigorous are the movements of its powerful claws, that but a few minutes are necessary for the animal to melt away from your view in the most compact soil."—(J. H. Clark.)

62. DICOTYLE TORQUATUS, Cuv. (p. 627.) Texas Peccary.

This species was occasionally met with by the Commission along the Rio Grande, but under circumstances when it was not convenient to preserve any skins.

"This animal habitually lives in the bottom lands of the water courses; it is not confined to such places, as it is not unfrequently seen on the prairie singly, or in a drove. Many stories are told of its ferocity; of its attacks without provocation; no manifest evidence of such a disposition came under my observation, though I have seen it chased and wounded repeatedly. In open ground it is somewhat shy, and for a hog runs with fleetness; and when pursued will dodge and squat with at least as much facility and success as a jack-ass rabbit. Its vicinity is easily detected by an odor, which, though less intense, is not much less offensive than that of the skunk. There is a swamp near Ringgold Barracks that perfumes the whole neighborhood with the odor of the peccary, and is known as the "wild-hog den," by which name (wild-hog) it goes among frontier men. The Mexicans apply to it the same term (moran) that they do to the domestic hog. Live Oak creek, a rivulet emptying into the Pecos near its lower crossing, is noted for the great number of peccaries inhabiting its course.

"The food of the peccary in southwestern Texas consists mainly of acorns and pecans; further west, and in higher regions, these sources of subsistence fail, and the occurrence of the animal is consequently rarer. The absence of any largely developed posterior appendage, usually designated as the tail, is the most characteristic and striking feature, not excepting the secretory sac, resting skin deep only on the rump, and which emits the odor. Neither the immediate removal of this sac, nor any other precaution or process, could render its lean and stringy hams palatable. Like the domestic hog, it both wallows and roots; the meagre traces in these respects show that the wild hog is less industrious than its domestic representative."—(J. H. Clark.)

"The peccary is not an uncommon animal in southwestern Texas. It is met with in greater or less numbers along all of the streams, and is especially numerous along Devil's river, Live Oak creek and the Pecos river. West of the Rio Grande we observed them only at San Bernardino.

"They are almost always associated in herds, composed of from five to ten individuals, and are very rarely found alone. They prefer the thickest and most impenetrable bushes, from which they are not easily driven out. In the localities where they are very numerous, their proximity, especially after sunset, may be discovered by the peculiar odor which they emit, and which is not entirely unlike that of the skunk, (*Mephitis,*) though of less intensity; this we particularly observed in travelling up the Pecos river.

"They sometimes become quite vicious, and might prove a dangerous antagonist on account of their sharp tusks and great activity.

"If one of a herd is wounded, the remainder will often turn and attack the assailant with great fierceness and desperation.

"In their choice of food they seem to give preference to pecans, walnuts, and acorns, though they also eat roots and other substances."—(Dr. Kennerly.)

63. CERVUS VIRGINIANUS, Boddaert, (p. 643.) Virginia Deer.

This species is abundant in many parts of Texas, though no specimens were collected.

"On the prairies near the coast this animal supplants the antelope and the black-tailed deer. It may be seen here grazing among the cattle of the settlements, where it is wilder and more difficult of approach than in wholly unfrequented regions. On the plains of northwest Texas and further westward the occurrence of the common deer is somewhat rare, and principally confined to the water-courses, where, besides the water and grass, is the additional attraction of trees and bushes, which serve as protection from the northers in winter and from the heat of the sun in summer. In the country lying between the Nueces and the Rio Grande, more deer were seen in one day than a week's travel disclosed in any other region traversed by the Boundary Commission. It is less gregarious than the antelope, but more so than the black-tailed deer; this latter prefers mountainous regions, and is never seen in company with the red deer."—(J. H. Clark.)

64. CERVUS MEXICANUS, Gmelin, (p. 653.) Sonora Deer.

"The Virginian deer, so common throughout the entire State of Texas, and particularly its southwestern portion, was also observed by us in considerable numbers in various localities west of the Rio Grande. Indeed, we believe that few species of animals are so generally spread over the entire continent as this, and at the same time in such great numbers. It was observed in the valleys of all the streams passed by us in our journey from El Paso to Los Nogales, as well as in the various mountain ranges, particularly the San Luis and Sierra Madre. In the valley of the Santa Cruz river and the adjacent country we found them in such numbers as to influence the belief that a few skilful hunters might have supplied our entire party with fresh meat.

The Mexicans of this region, having but few fire-arms, and being very much afraid of the Indians, do not often hunt them. Indeed, thirty miles west of the village of Santa Cruz, these animals seemed to be so unaccustomed to the sound of a gun that we have known them, when the hunter was concealed, to be fired at several times before becoming sufficiently alarmed to take flight.

"During our stay at Los Nogales in the month of June, particularly the latter part, the heat during the day was quite oppressive; and the valleys of the streams, with their thick undergrowth affording a good protection from the rays of the sun, were the favorate places of resort for these animals. Very early in the morning they were found feeding on the hills, but retired under the shelter of the bushes about ten o'clock, after which time they could be killed as easily as rabbits, by the hunter passing through the undergrowth with a gun charged with buck-shot. They would rarely spring from their concealment until approached within twenty paces.

"At this season, June, the horns of the bucks were but a few inches in length, and the females generally far advanced in pregnancy. We observed often the young of the previous year still following the doe, which was about to bring forth another progeny."—(Dr. Kennerly.)

65. CERVUS MACROTIS, Say, (p. 656.) Black tailed Deer.

"We did not observe this animal until we reached the vicinity of the valley of the Corralitos river, and here it was not very common. It was rarely seen in the immediate valley of the river, except late in the afternoon, just before sunset, when it came to drink, but preferred the neighboring mountains or hills. In the San Luis mountains and the Sierra Madre they were very numerous; but we noticed, while near these localities, that this species is much more apt to be driven from its accustomed haunts than the other, (*Cervus virginianus.*) In a few weeks, although at first equally as numerous, if not more so, than the latter, it disappeared almost entirely, while the red deer became only a little more shy, but its numbers did not seem to diminish.

"It is somewhat curious that we did not observe the black-tailed deer after leaving the Sierra Madre, although it is found in great numbers in California. The belt of country traversed by us, included between that mountain and the 111th meridian, seemed to be almost, if not entirely, without this animal, while in several localities the Virginian deer and antelope were both very common."—(Dr. Kennerly.)

66. ANTILOCAPRA AMERICANA, Ord. (p. 665.) Prong Horn Antelope; Cabree.

This species is abundant in Texas, although no skins were collected by the survey.

"On the plains lying between the Nueces and the Rio Grande, the great mustang range, and where the common deer is very abundant, but few antelopes are to be seen. It is not till west of the Pecos is reached that droves are observed dotting the most open and naked prairies, which it undoubtedly prefers and habitually inhabits; it is no rare occurrence, however, to find it in mountain valleys, from which it will sometimes take to the mountains, but usually from fright, not choice. Being shy, and quick to take alarm, it always keeps at a great distance. Occasionally one, either dumfounded with fear or overcome with curiosity, will come right up to a train by a series of advances and reconnaissances, while the rest of the herd are lost to the sight in an opposite direction. It is on plains destitute of most forms of vegetation except grass that the largest herds of this animal are to be found. When it is considered that such prairies cover an extent of fifty or even one hundred miles in some directions without water, its adaptability to the regions inhabited is manifest. There is no bond of sympathy between the antelope and the deer, for they are never seen herding together, and seldom occupying common ground. The absence of water and luxuriant grass in the antelope region may account in a measure for the rarity of the deer. Though much scattered when feeding quietly, a herd flocks together as it runs off. The most remarkable habit of the antelope is its tendency to take and continue but one direction in its flight; so determined and obstinate is its disposition in this respect as to be impelled across arroyos, over mountains, and even through trains. To start it as a common deer is an unheard of thing, due to watchfulness rendered easy by the openness of the country inhabited. Shades of color varying from a deep fawn to an almost pure white are observable at a distant view in the same herd Its motion is more rapid as well as more regular than that of the deer, never leaping like the latter animal. Its flesh is also juicier and finer; its superiority is appreciable even by one who can make no pretension to an epicurean taste. Frontier men have assured me that they have sabred the antelope on ordinary horses during sleety weather, when they say it is unable to keep its feet. The wonderment that this animal sometimes expresses, and its apparent inability to see things aright, leads to the suggestion of some peculiarity in the eye, either of construction or position; its location on the side of the face, and directly at the base of the horn, would impress any one with its singularity. An allusion to its preference for open prairies as a habitat has already been made. This region, it will be remembered, is the home of the prairie dog, and its dependents, the rattlesnake, the owl, and the Holbrookia. The antelope is said to have an abiding hatred for the rattlesnake, which it decoys first into a striking attitude, and then utterly annihilates by leaping into the air and coming down upon it with its four sharp-cutting hoofs placed together."—(J. H. Clark.)

"On several occasions we have travelled over the road between San Antonio, Texas, and El Paso, on the Rio Grande, but we never have observed the antelope in that country until after crossing the Pecos river, and from that stream as far as the Rio Grande found it always the most common of the larger species of quadrupeds. On the immense plains and wide valleys stretching out from the Limpia mountains in all directions large herds are often seen. The number of individuals composing a herd vary from eight or ten to several hundred. We have often seen more than a hundred together, and perhaps sometimes as many as three hundred.

"In going westward from the Rio Grande we found them equally as numerous as in the country east of that stream, as far as we travelled. In the northern part of Sonora they were very common, and for the most part less shy and more easily captured than in other localities. In the less frequented regions the hunter has only partially to conceal himself and shake his hat or handkerchief, thus attracting the attention of the animals, whose curiosity is so great as to cause them to approach within gun-shot. This approach, however, is not made without apparent caution, for while performing it they walk very slowly, often stopping, and should they get to the windward of the hunter beat a rapid retreat, and soon disappear in the distance.

"In the northern part of the States of Chihuahua and Sonora we found the females very far advanced in pregnancy about the middle of July."—(Dr. Kennerly.)

OVIS MONTANA, (p. 673.) Big Horn; Mountain Sheep.

Of this animal no specimens were collected, though frequently seen by the Commission.

"*The Mountain Sheep, Big Horn, of the Americans of California and New Mexico; Borrego cimaron, of the Sonorians; Tenaizah, of the Apaches; Tajé, of the Cochimés of Lower California.*—The rocky sierras of northwestern Sonora, where want of water not only forbids the existence of every other species of ruminant, and where even the coyote, with all his cunning and tenacity, is nearly ruled out, are the favorite home of the mountain sheep.

"The state of drainage peculiar to a country seems to establish principally the existence of one or the other species of those ruminants, which are indigenous to the regions adjacent to the boundary line.

"Thus, the common deer belongs to the more shady lowlands, the mule deer to the uplands; the antelope ranges over the open mountain table lands, whilst the mountain sheep has its home over the rugged crests of the waterless sierras of northwestern Sonora and New Mexico.

"Whilst surveying along the boundary line, I had sometimes occasion to leisurely observe these shy and comparatively rare animals upon their native ground. As usually an unarmed man is always led nearest to game, so was I on one day, walking almost side by side at eight to ten yards distance, with a large ram, which certainly stood upon his legs nearly four feet high above ground, with a length of five feet from head to tail.

"One whole afternoon, (I was waiting then for signals from another station,) a singular noise in the cliffs of an opposite mountain slope fixed my attention, and it was some hours before I was able to find out the real nature of it. It sounded as if a rock had been precipitated somewhere, and I first inclined to be satisfied with that; but as the sound, after certain intervals, was so often repeated, and the game lasted until evening, I attributed it to something else, until I seized upon the correct idea. The noise was nothing else than the result of a butting combat between two rams. On the whole of these mountain tops there was not a single horizontal or gently inclined spot where the round footprints of this animal could not be observed. In some places well beaten pathways lead up to the most rugged portions of the rocky sierras, where man hardly may trust his foot, lest he may be precipitated with the loosened detritus of weather-washed decomposed rocks. The water on which the inhabitants of these forsaken desert mountains depend are mostly but rain-water holes, (tinajas,) in which, during the hot season, water must become scarce enough.

"I have been assured by hunters that a flock or drove of these big horns, when closely pursued, will not shrink from a general leap over a precipice of one hundred and more feet deep to effect their escape. It is also stated that they do so without any risk, but escape, every one uninjured, by throwing themselves head foremost upon the heaviest portion of their gigantic horns, the spiral shape of which seems to paralyze the hardest shock. This, if not a fact, is at least generally believed. It is also not a modern invention, for Clavigero mentions the same, as he heard it from the lips of the California Indians.

"The horns of the mountain sheep are most formidable weapons for defence even against larger enemies; as, for instance, wolf or puma. The nature of the ground where the mountain sheep ranges hardly permits any ambush on the part of the aggressor, because there is no timber or brushwood. To meet a blow of those gigantic horns must be rather a risk of life; the more so, when an attacked big horn succeeds in driving his antagonist between a rocky wall and his 'battering ram.'"—(A. Schott.)

67. BOS AMERICANUS, Gmelin. (p. 682.) American Buffalo.

No skins of this species were collected by the Boundary Commission, though skulls and skeletons were frequently met with.

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Fig. 2—*Macrotus californicus*, Baird.—Fort Yuma.

2. *a*—side view of the head; 2. *b*—back view of do., showing the membrane connecting the ears.

PLATE II.

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Fig. 2—*Putorius frenatus*, Aud. Bach.—Matamoras.—Young animal, before shedding its milk teeth. From an alcoholic specimen.

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PLATE III.

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Sciurus limitis, Baird.—Devil's river, Texas.

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Sciurus castanonotus, Baird.—Copper Mines.

PLATE VI.

Fig. 1—*Tamias dorsalis*, Baird.—Copper Mines.

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N. B. The engraver has neglected to represent the hairs under the nostrils.

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NOTE.—In this figure the posterior plantar tubercle has been omitted by the engraver; as also the furrows in the anterior faces of the upper incisors, both here and in figure 4.

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PLATE XXI.

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Fig. 2—*Sciurus castanonotus,* Baird.—No. 1107.—Copper Mines, New Mexico.—Skull natural size. References *a–e.*

Fig. 3—*Spermophilus couchii,* Baird.—No. 1255.—Santa Catarina, Mexico.—Skull. References *a–e,* natural size; *f*—left upper molars from below; *g*—left lower molar from above; *f* and *g* about one-half greater than natural size.

Fig. 4—*Spermophilus tereticauda,* Baird.—No. 2419.—Fort Yuma, Cal.—Skull. References as in preceding figure, (*a–g,*) *f* and *g* nearly twice natural size.

PLATE XXII.

Fig. 1—*Spermophilus grammurus*, Bach.—No. 1111.—Copper Mines, New Mexico.—Skull natural size. References *a–e*.

Fig. 2—*Spermophilus mexicanus*, Licht.—No. 1267.—Brownsville, Texas.—Skull natural size. References *a–e*.

Fig. 3—*Spermophilus spilosoma*, Bennet.—No. 1323.—El Paso.—Skull.—*a–e*, natural size; *f*—left upper molars from below; *g*—left lower molars from above; *f–g*, rather more than twice natural size.

PLATE XXIII.

Fig. 1—*Geomys clarkii*, Baird.—No. 1624.—Presido del Norte. Skull.—*a–e*, natural size; *f*—left upper molars from below; *g*—left lower molars from above; *f–g* magnified nearly three times.

Fig. 2—*Dipodomys agilis*, Gambel.—No. 1630.—Monterey, Cal.—Skull. *a–e*, natural size; *f*—left upper molars from below; *g*—left lower molars from above; *h*—front view of upper incisors; *f–h*, magnified a little more than twice.

Fig. 3—*Dipodomys ordii*, Woodhouse.—No. 1632.—Western Texas.—Skull. References *a–h*, as in the last figure.

Fig. 4—*Dipodomys ordii*, var. *montanus*.—No. 1631.—Upper Rio Grande valley. *a*—left upper molars from below; *b*—left lower molars from above; c—front view of upper incisors. Magnified about twice.

Fig. 5—*Thomomys umbrinus*, Baird.—No. 1231.—Sonora.—Skull. References *a–g* as in fig. 1; *f* and *g* magnified nearly three times.

Fig. 6—*Perognathus hispidus*, Baird.—No. 1696.—Female.—Charco Escondido, Mexico.—Skull. References *a–g*, as in fig. 1; *f–g* magnified rather more than twice.

PLATE XXIV.

Fig. 1—*Neotoma mexicana*, Baird.—No. 260.—Colorado bottom.—Skull. *a*—from below; *b*—from above; *c*—from the side; *d*—left side of lower jaw; *e*—do. from above; all of natural size; *f*—left upper molars from below; *g*—left lower molars from above; *f* and *g* magnified nearly three times.

Fig. 2—*Neotoma micropus*, Baird.—No. 1676.—Male.—Charco Escondido, Mexico.—Skull. References *a–g*, as in the preceding figure; *f* and *g* magnified nearly three times.

Fig. 3—*Sigmodon berlandieri*, Baird.—No. 1667.—Coahuila, Mexico.—Skull. References *a–g*, as in figure 1; *f* and *g* magnified nearly three times.

Fig. 4—*Reithrodon megalotis*, Baird.—No. 2281.—Janos to San Luis Spring, New Mexico.—Skull. References *a–g*, as in fig. 1; *f–g* magnified nearly three times.

PLATE XXV.

Fig. 1—*Lepus callotis*, var. *flavogularis*?—No. 1215.—San Antonio to El Paso.—Skull natural size. References *a–e*.

Fig. 2—*Lepus artemisia*, Bach.—No. 1232.—San Antonio to El Paso.—Skull natural size. References *a–e*.

PLATE XXVI.

Dasypus novemcinctus, Linn.—No. 1409—Matamoras, Mexico.—Skull natural size. References *a–e*.

PLATE XXVII.

Fig. 1—*Dicotyles torquatus*, Cuv.—No. 1101.—Female.—Brownsville, Texas.—Skull; teeth partly worn. References *a–e*, half natural size; *f*—right upper molars from the side; *g*—left upper molar from below; *h*—left lower molar from the side; *i*—do. from above; *f–i* natural size.

Fig. 2—*Dicotyles torquatus*, Cuv.—No. 1008.—Rio Grande.—Teeth as of a younger animal, with the crowns unworn; *a*—left upper molars from the side; *b*—do. from below; *c*—left lower molars from the side; *d*—do. from above. All natural size.

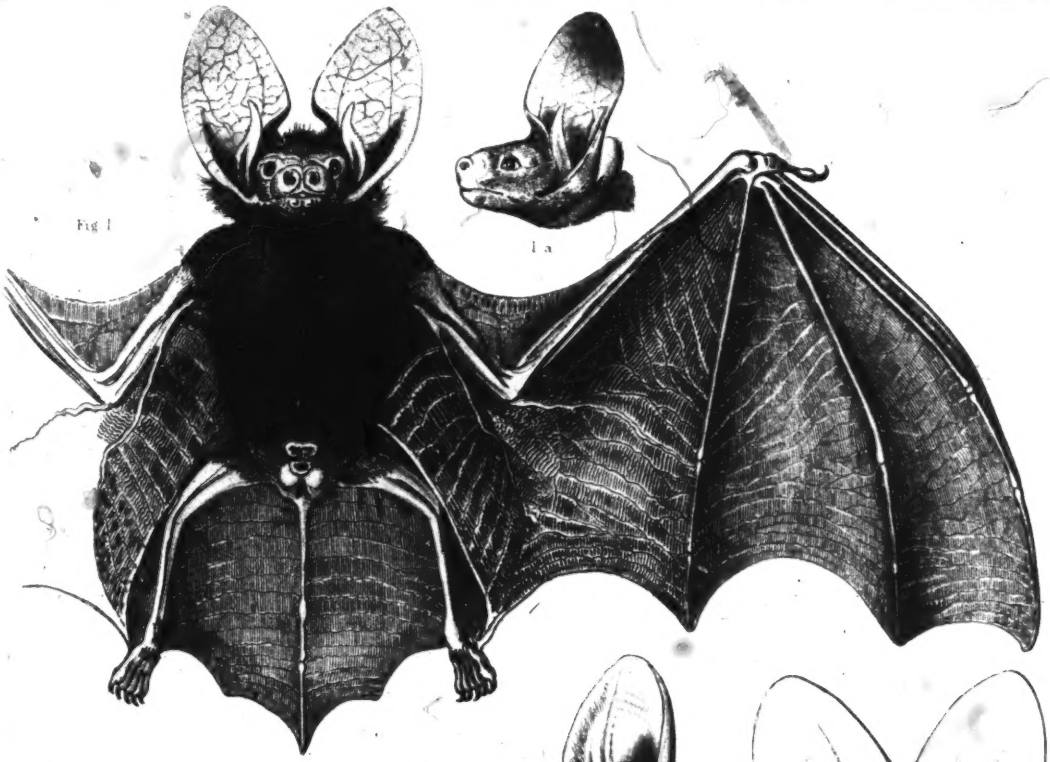


Fig. 1

1 a

2 a

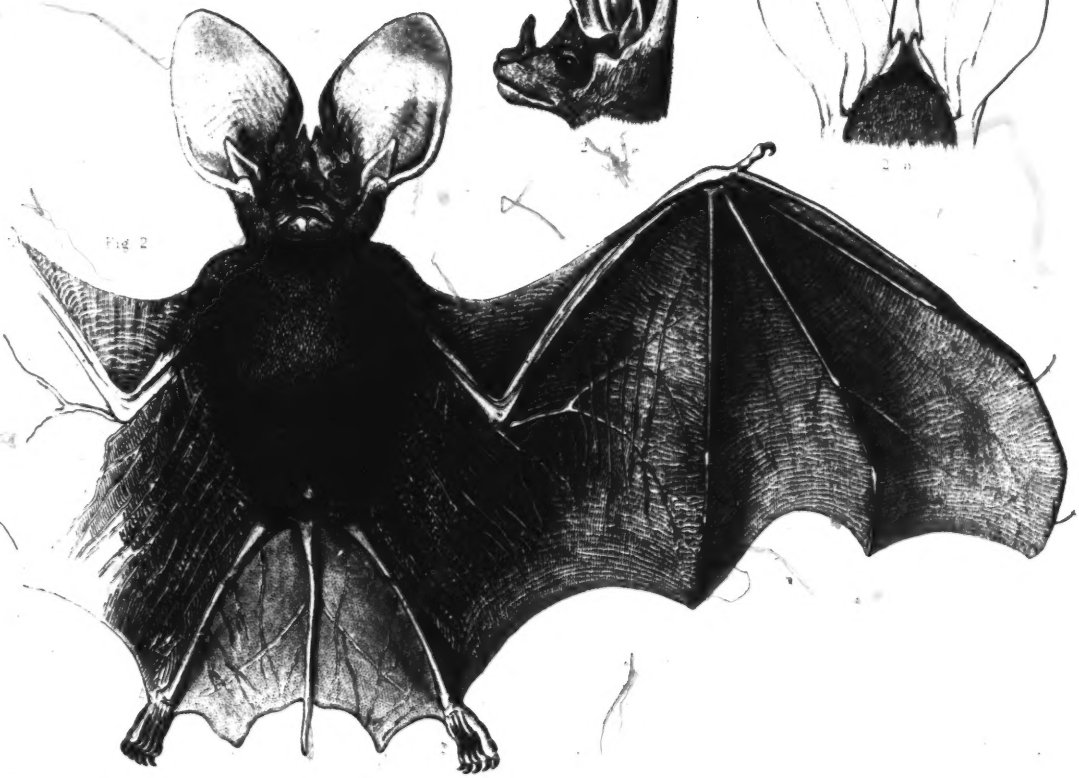


Fig. 2

J. H. Richard del

F. Michaud lith.

2 a

Fig 2

2 b

2 c

2 d

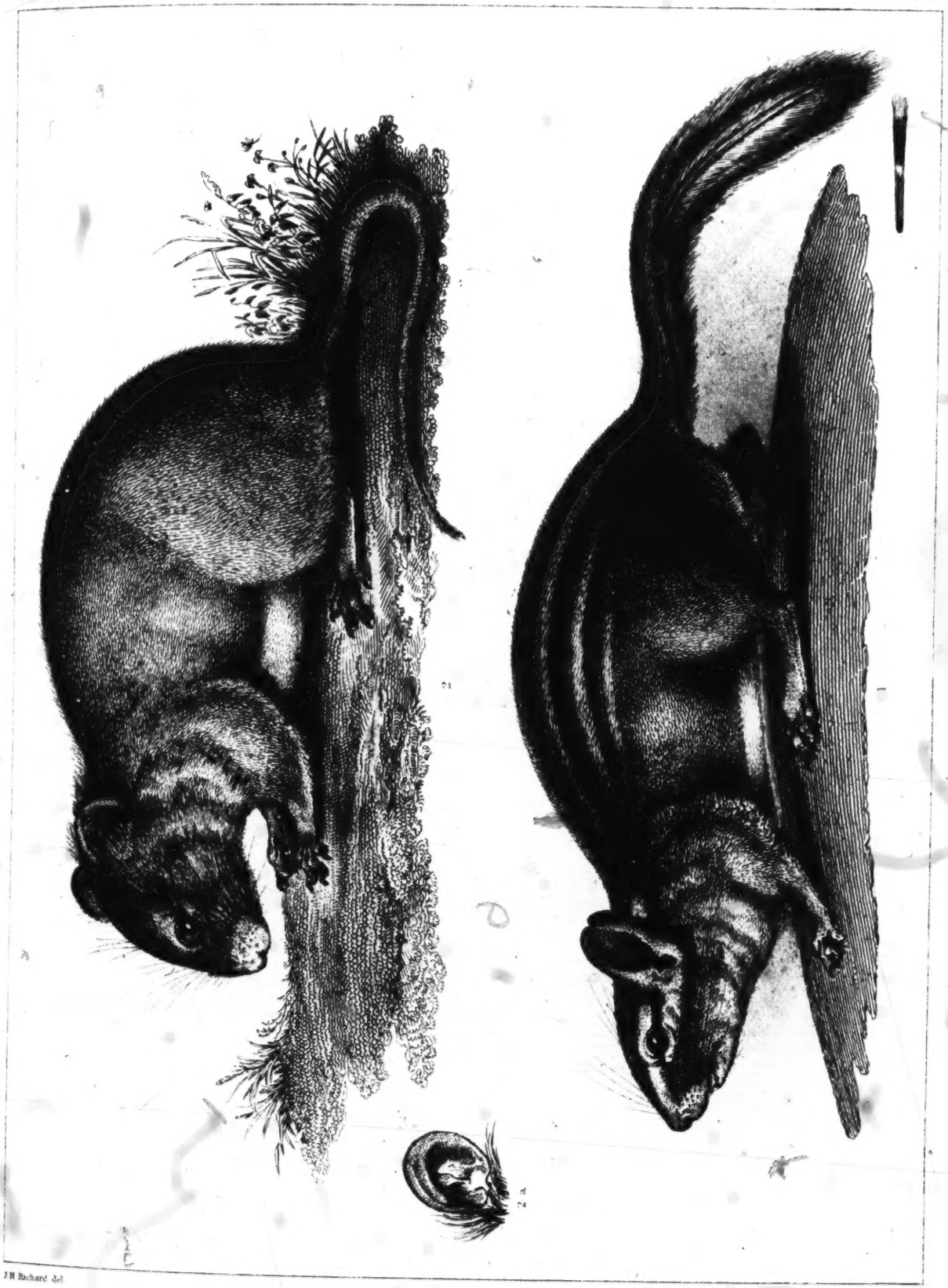
Fig 1

H Richard sc

J. Metzerott sc

J.H. Bachard. del.

Richard del.



J.H. Richard del.

H. Merzeyewski sc.

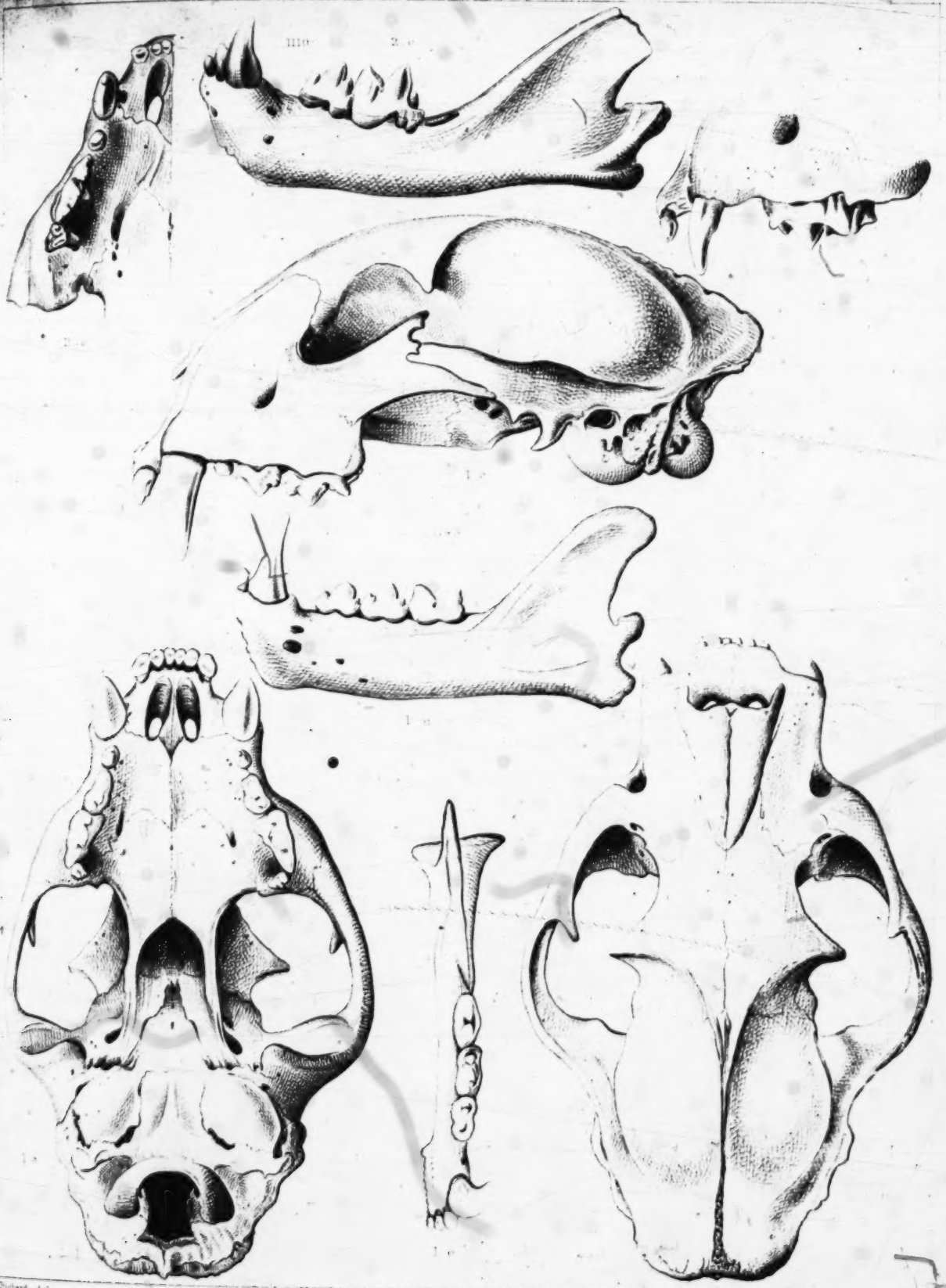
Buchani del

J.H.Richard del.

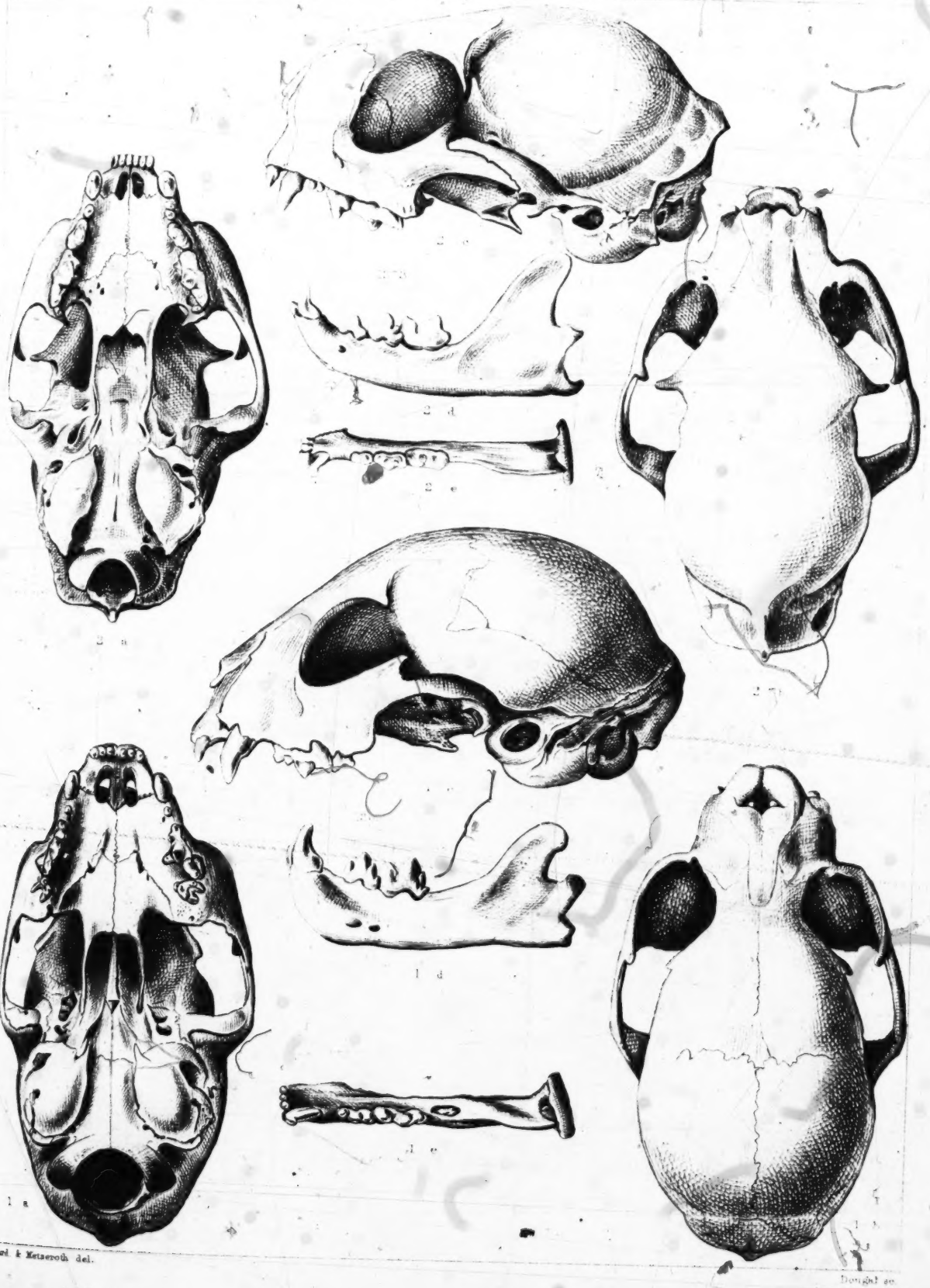
R. Metzerott sc.

J.M.Richard del

P. Mesnier sc.

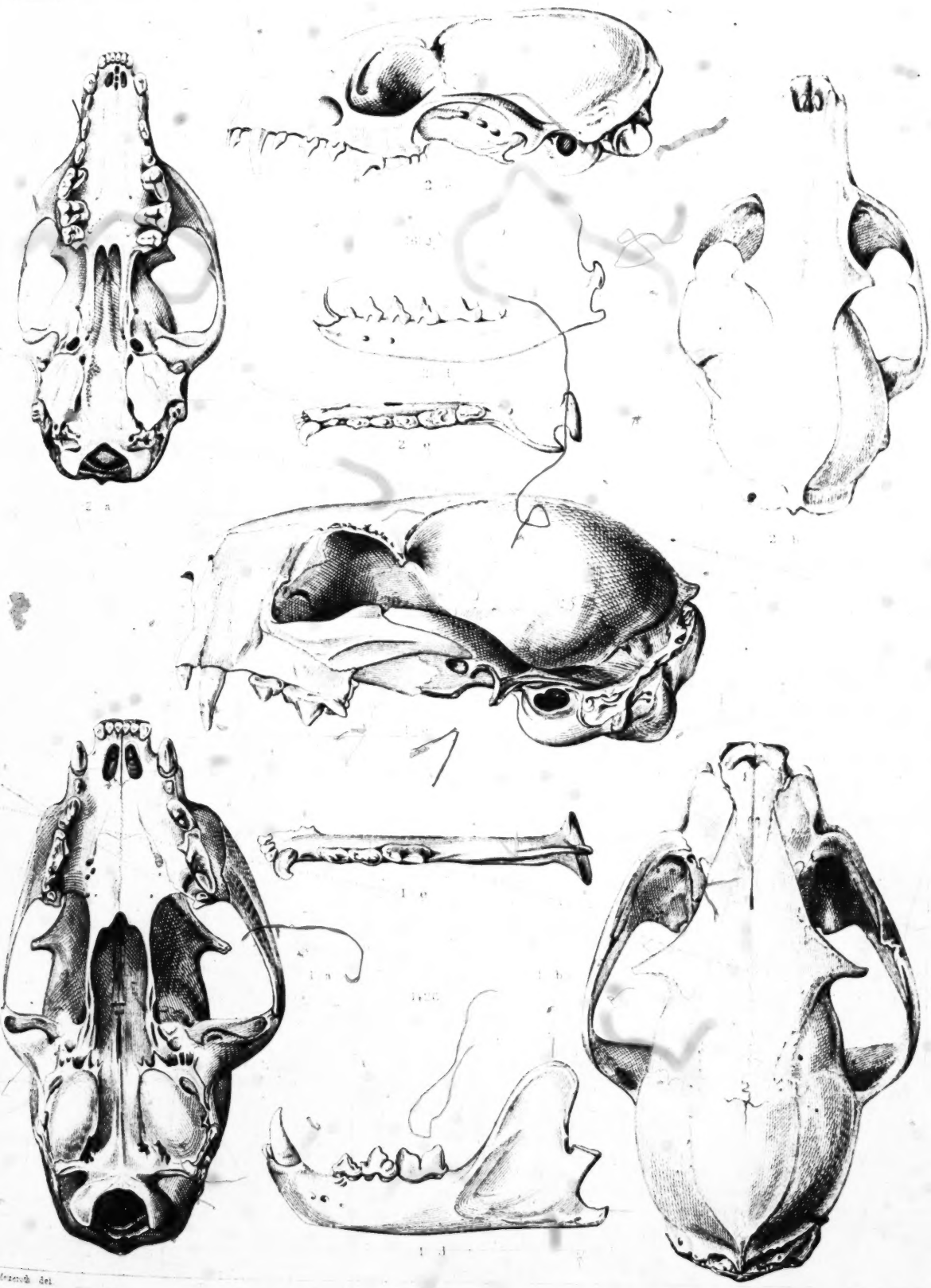


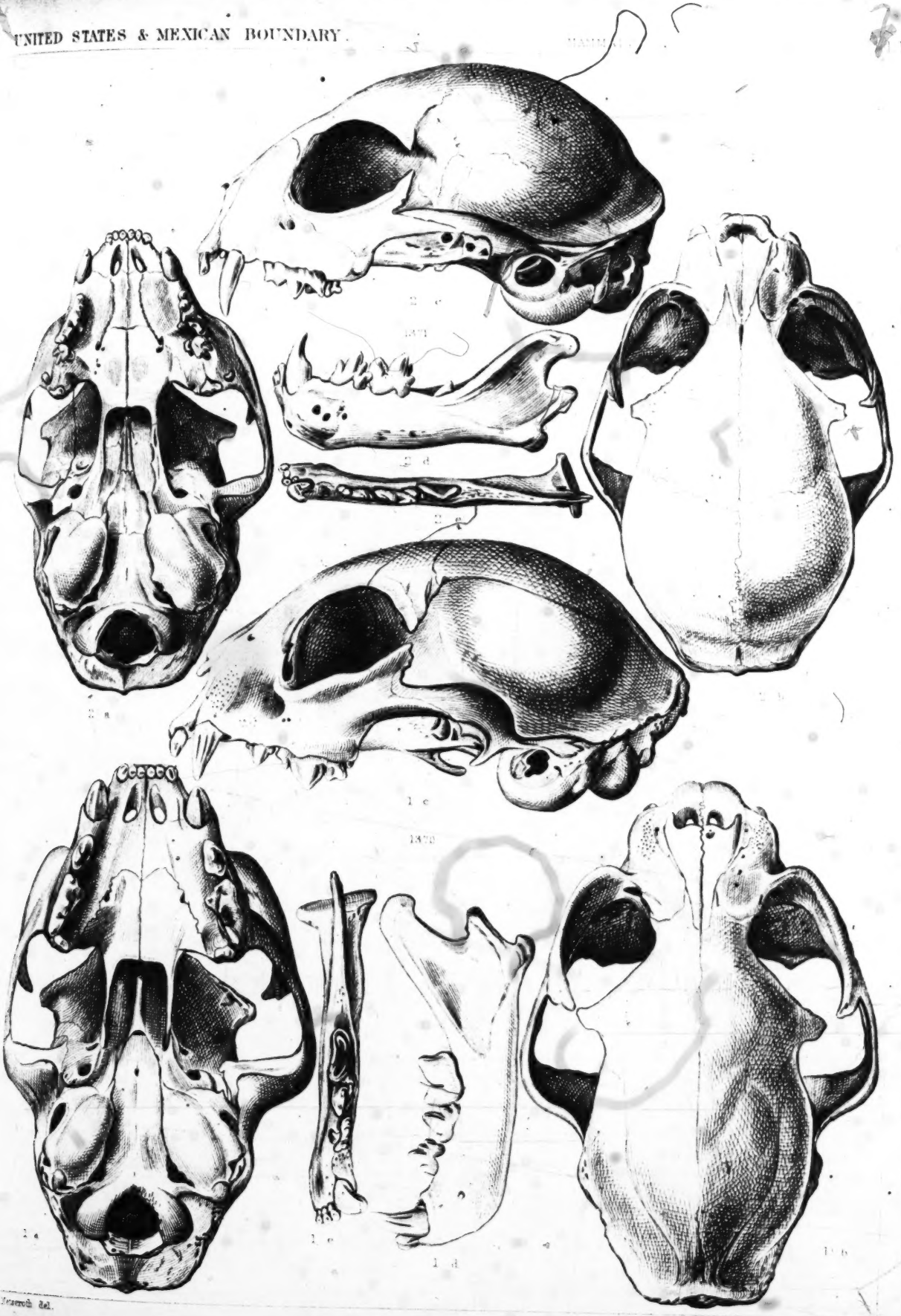
Blatchley del.



Sartorius & Metzeroth del.

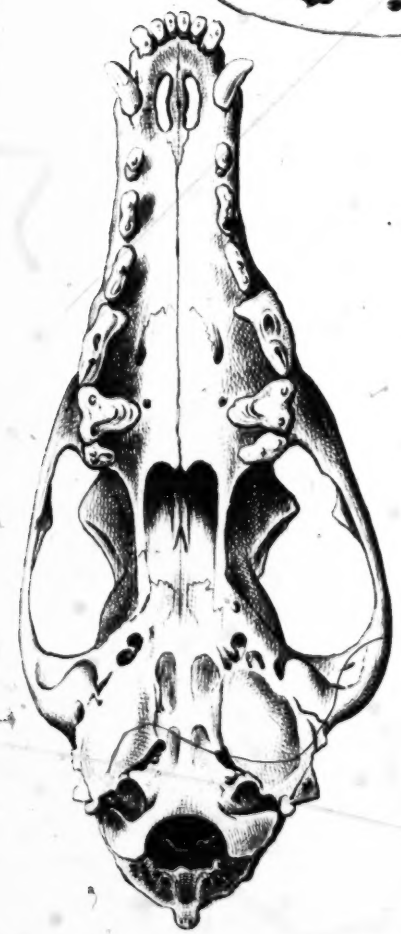
Dowlight sc.

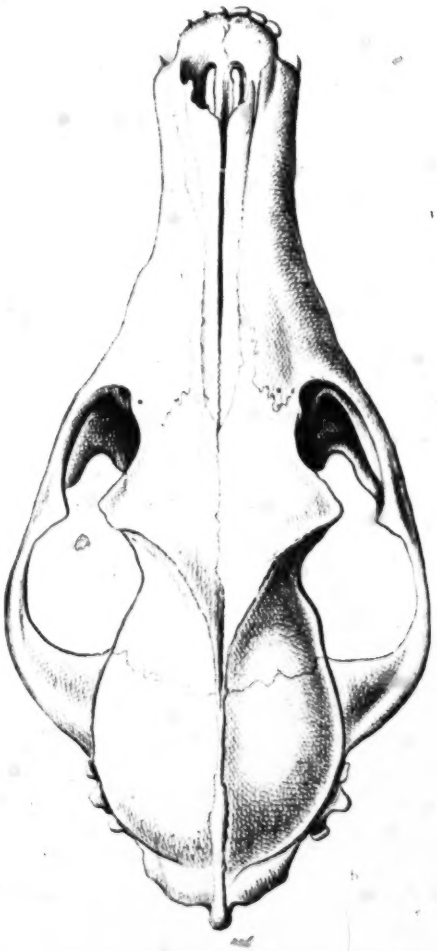




Forsyth del.

Dougal sc.





Richard del. Lithgow sc.

3 a

3 c

3 b

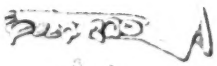
3 d

3 e

2 a

2 c

2 d



2 e

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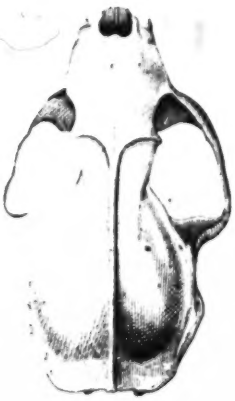

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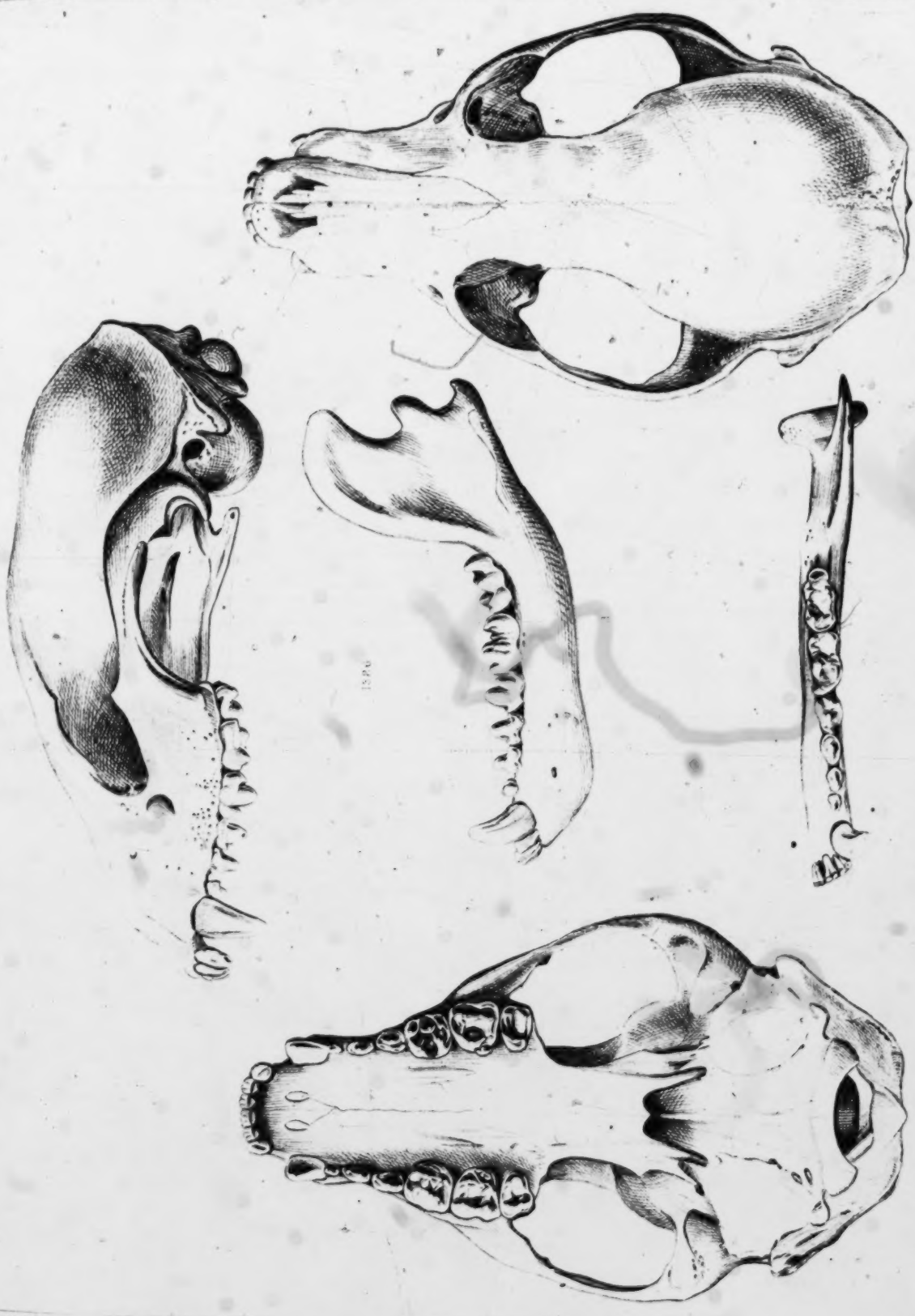
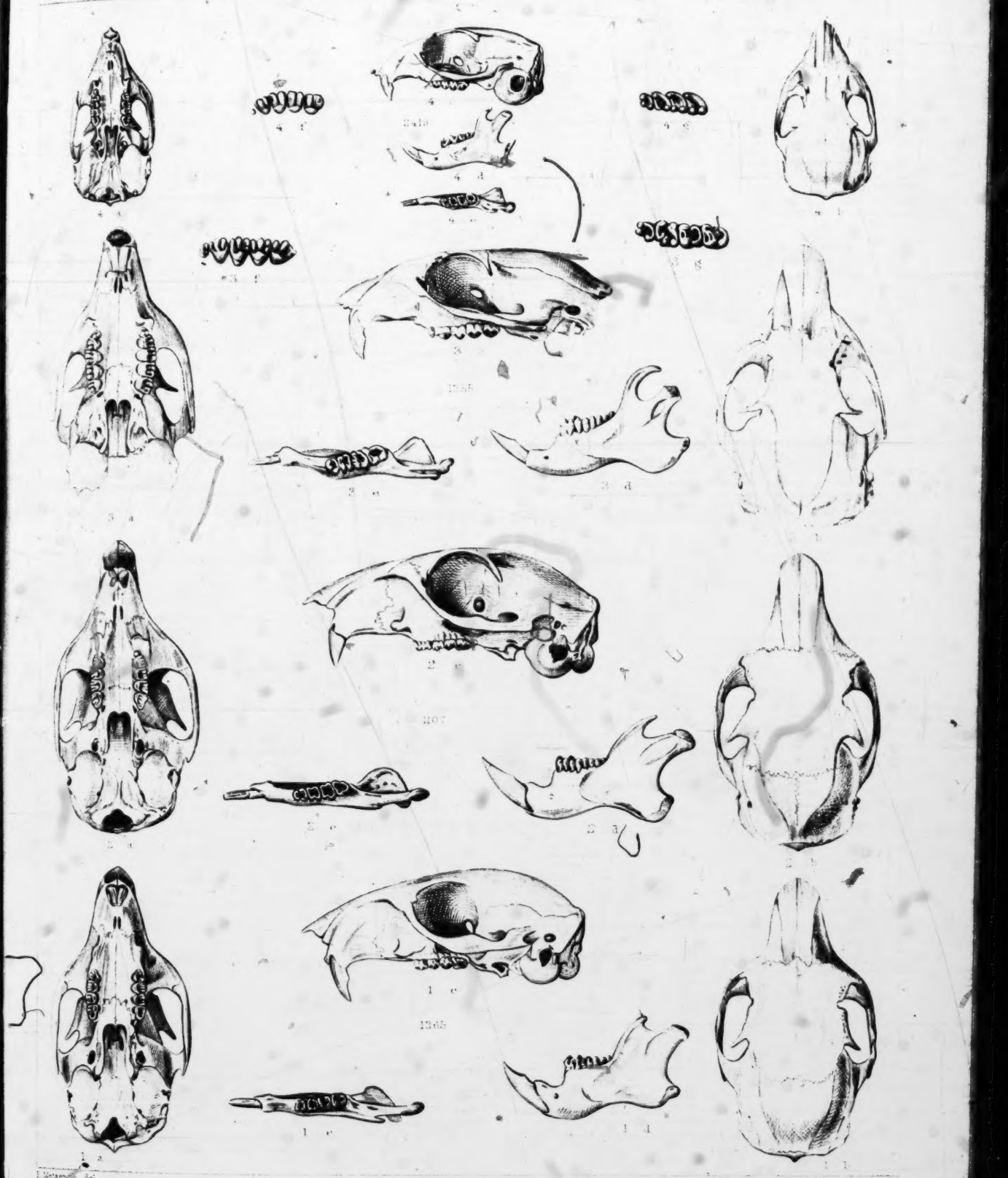


Mazama del. Bowen &c



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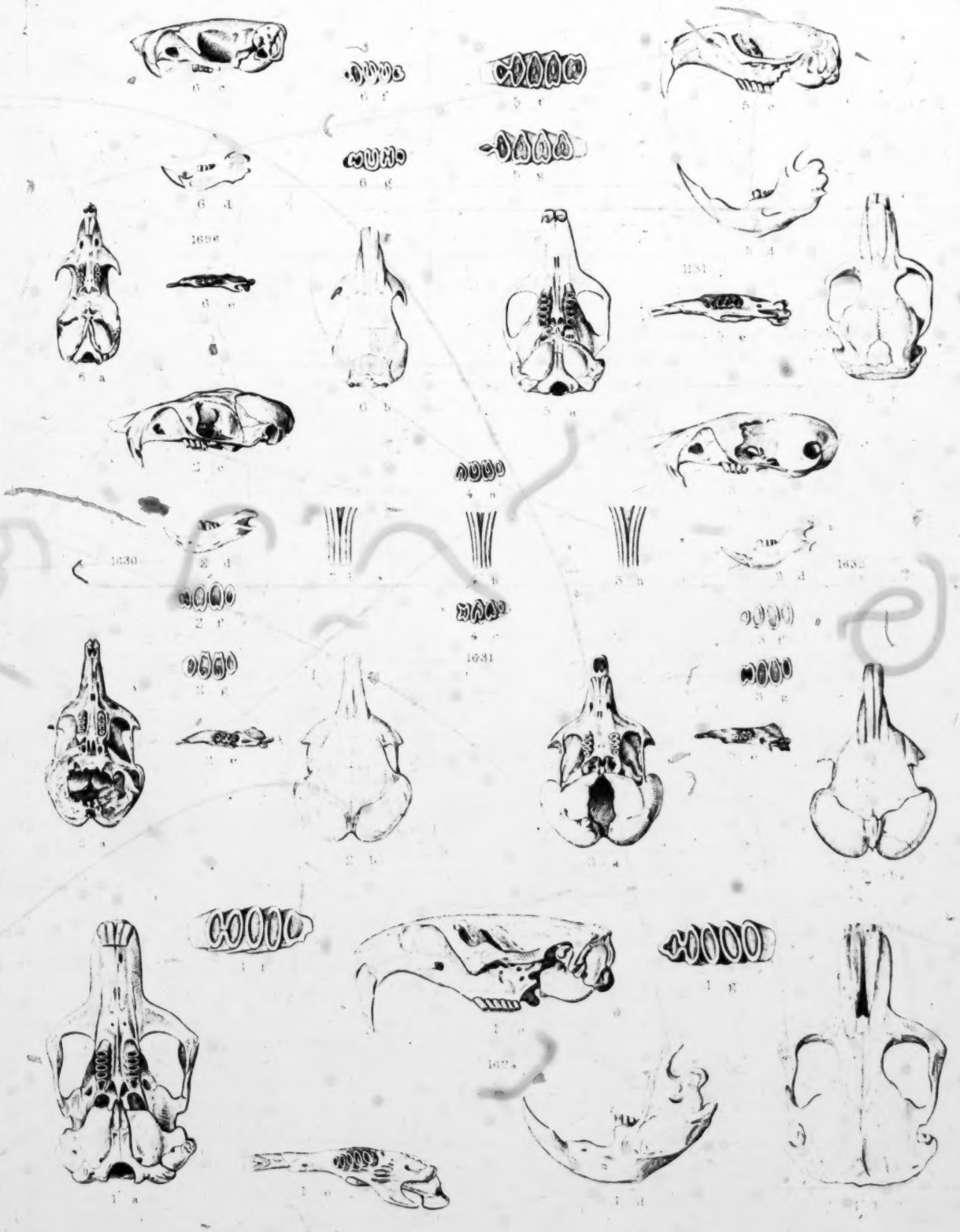
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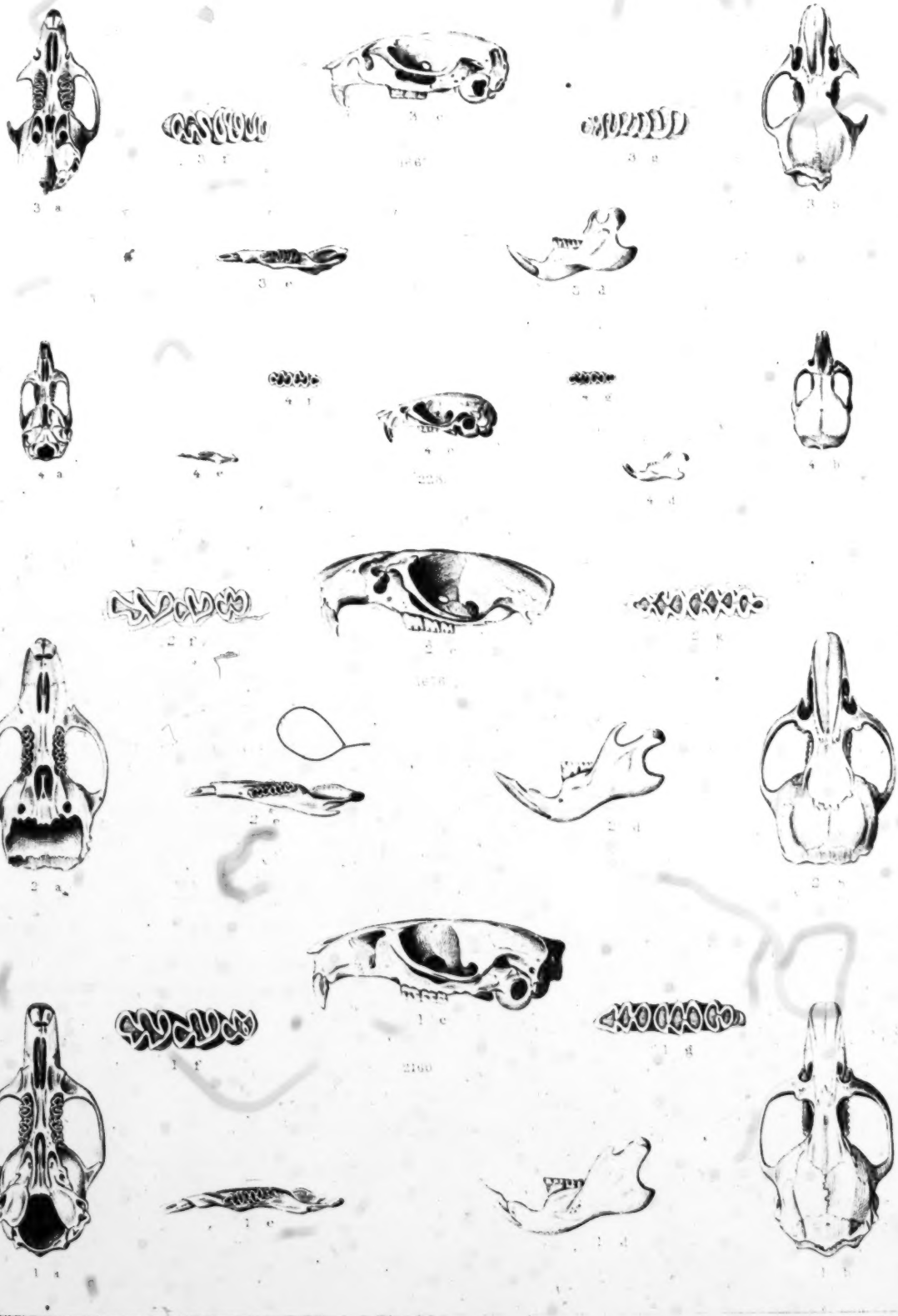

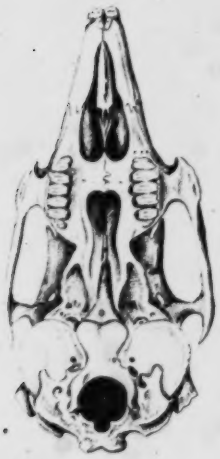

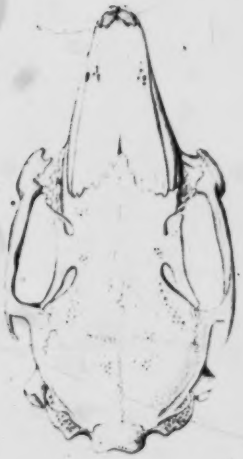

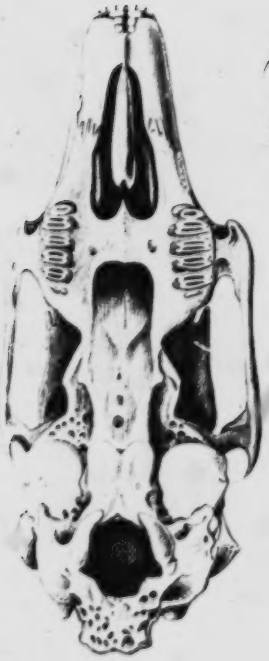

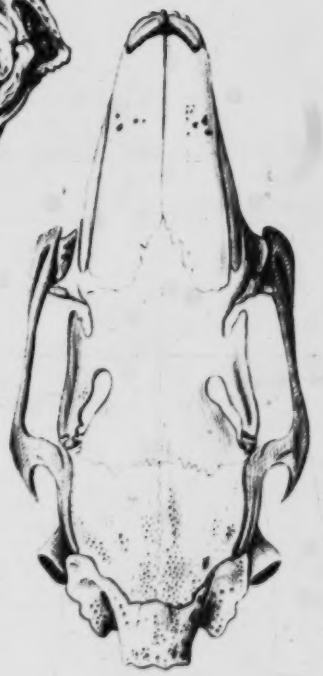

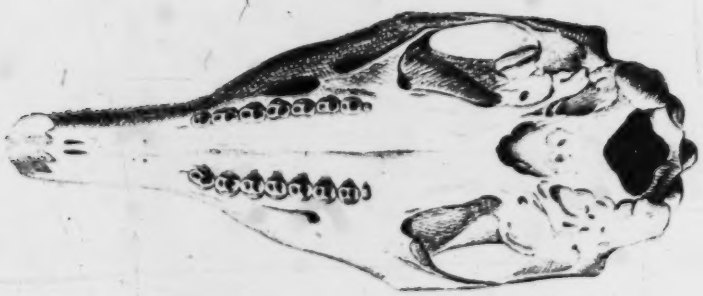

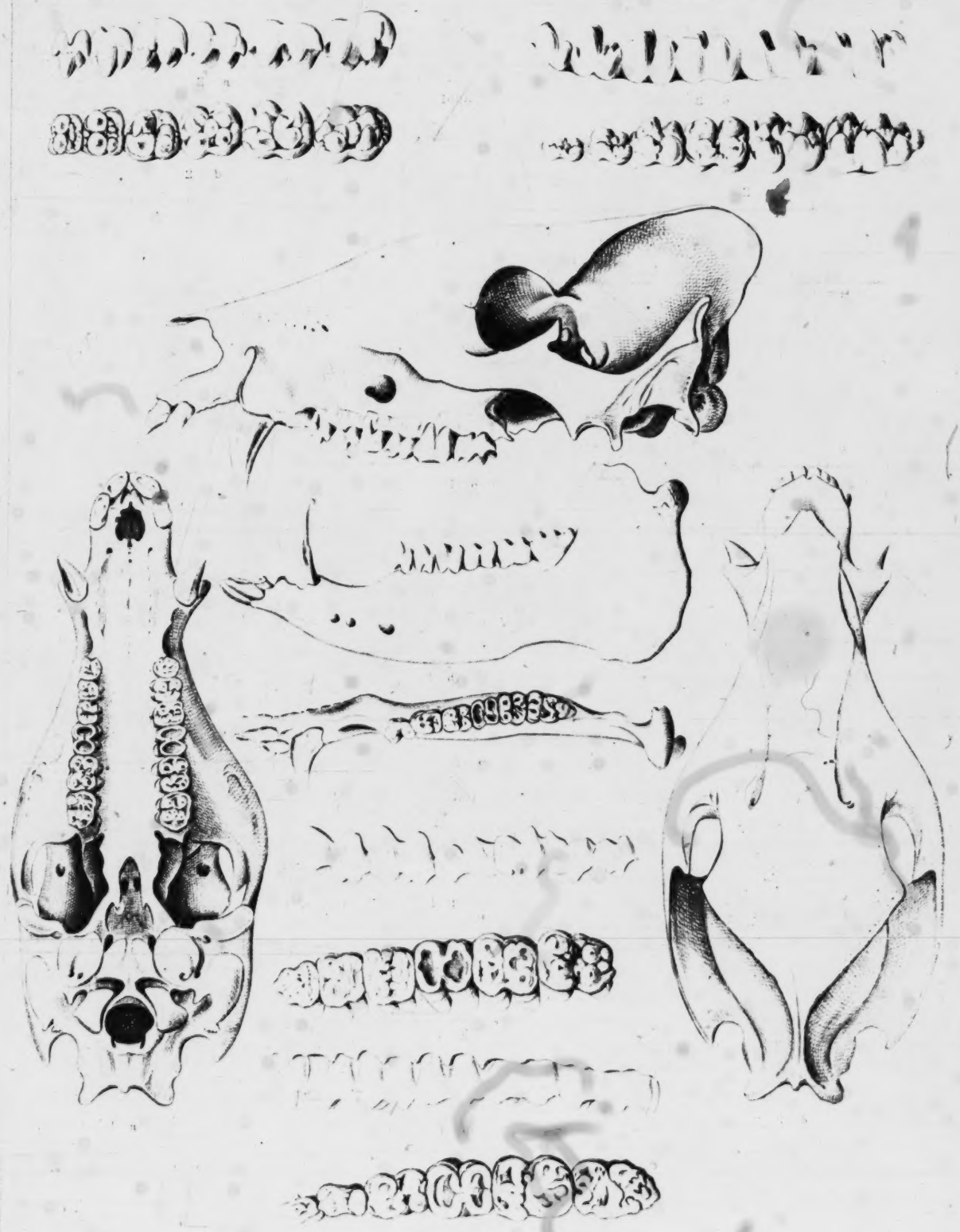

UNITED STATES AND MEXICAN

BOUNDARY SURVEY,

UNDER THE ORDER OF

LIEUT. COL. W. H. EMORY,

MAJOR FIRST CAVALRY, AND UNITED STATES COMMISSIONER.

BIRDS

OF THE BOUNDARY,

BY

SPENCER F. BAIRD,

ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION.

WITH NOTES BY THE NATURALISTS OF THE SURVEY

REPORT ON THE BIRDS.

1. CATHARTES AURA. Ill. (Gen. Rep. p. 4.)*—Turkey Buzzard.

8497. Matamoras, Mexico; Lieut. Couch.

2. FALCO COLUMBARIUS, L. (p. 10.)—Pigeon Hawk.

5505. El Paso. J. H. Clark—4615. Colorado river California. A. Schott.

Quite common; flies but little, generally watches for its quarry from the limb of a dry tree.—(Couch.)

3. FALCO AURANTIUS, Gm. (p. 10.)

4129. New Leon, Mexico. Lieutenant Couch. (145.)

Has a soft cry or scream. Eats insects and small birds; very rare; and retired in its habits.—(Couch.)

4. FALCO FEMORALIS, Temm. (p. 11.)

Observed in New Mexico near the boundary line by Dr. Heermann.

5. FALCO SPARVERIUS, Linn. (p. 13.)—Sparrow Hawk.

4570. San Felipe, Texas. A. Schott.—8518, San Elziario, Texas. Dr. Kennerly.

Observed more frequently in the valley of the Rio Grande than elsewhere.—(Kennerly.)

6. ACCIPITER COOPERI, Bon. (p. 16.)—Cooper's Hawk.

? 4619. Colorado river, California. A. Schott, (53.)

7. ACCIPITER FUSCUS, Gmelin, (p. 18.)—Sharp-shinned Hawk.

8513. Camp Yuma, California. A. Schott, 23.

8. BUTEO SWAINSONII, Bon. (p. 19.)

Pecos River.

9. BUTEO CALURUS, Cassin. (p. 22.)

Copper Mines, New Mexico.

10. BUTEO BOREALIS, Gm. (p. 25.)—Red-tailed Hawk.

?? 4617. Jamacha Ranch, California, and Santa Isabel, California. A. Schott. (7,14.)

11. BUTEO MONTANUS, Nutt. (p. 26.)—Western Red-tail.

4611. California. A. Schott.—8536, Laguna, and 8532, Devil's river, Texas. Dr. Kennerly.

The bird was often seen between the coast of Texas at Indianola and the Rio Grande at El Paso del Norte. It seemed to feed indifferently upon reptiles, particularly lizards, and the smaller quadrupeds and birds. The stomach of the specimen was almost completely filled with lizards.—(Kennerly.)

12. BUTEO ELEGANS, Cassin. (p. 28.)

4618. Santa Isabel, California. A. Schott, 23.

* These references are to the page of the general report on birds in vol. IX of the series of Pacific Railroad Reports, where the species are all described in detail, and their synonyms given.

13. ARCHIBUTEO FERRUGINEUS, Gray, (p. 34.)—Squirrel Hawk.

9122. Fort Davis, Texas. Dr. Kennerly, (2.)

The only specimen procured. Observed in "a prairie dog town," of large extent, intently watching at a hole of one of those animals. While in this position, was observed to strike at the prairie dog with its claw when its head was protruded. Being very intent upon its prey it was easily approached and shot.—(Kennerly.)

14. ASTURINA NITIDA, Bonap. (p. 35.)

4128. New Leon, Mexico. Lieut. Couch.

15. CIRCUS HUDSONIUS, Vieillot. (p. 38.)—Marsh Hawk.

5548. San Elziario, Texas, December, 1854. Dr. Kennerly.

Wherever we found a marsh of any extent, either east or west of the Rio Grande, there we were sure to find this bird. Flying near the surface, just above the weeds and canes, it performs its endless circles hour after hour, ever and anon darting after the small birds that it starts from their cover. Sometimes, when pressed by hunger, it will attack the ducks, particularly the smaller ones, as teal, &c., that may be feeding in the lagoons.—(Kennerly.)

16. PANDION CAROLINENSIS, Bon. (p. 44.)—Fish Hawk.

4616. Colorado river, California. A. Schott.

17. POLYBORUS THARUS, Cassin. (p. 45.)—Caracara.

4122. Monterey, Mexico. Lieut. Couch.—9136. Texas. A. Schott.

This species is exceedingly abundant from the Rio Grande to the Sierra Madre. A male was killed on the nest, which is composed of sticks on quite low trees.

It destroys large numbers of the Texas field-rat (*Sigmodon berlandieri*.)—(Couch.)

18. CRAXIREX UNICINCTUS, Cassin. (p. 46.)—Harris' Buzzard.

4123. Brownsville, Tex. Lt. Couch.—Oyster Point, Tex. A. Schott.

19. STRIX PRATINCOLA, Bon. (p. 47.)—Barn Owl.

8701. Texas. A. Schott.—9132. Texas. J. H. Clark.

Found nesting in May in holes burrowed into the bluff banks of the Rio Frio. The burrows were nearly horizontal, with a considerable excavation near the back end, where the eggs (three or four in number and of a dirty white) were deposited. It allows the eggs to be handled without showing any concern. There was no lining whatever to the nest.—(Clark.)

Rare at Monterey. Common on the lower Rio Grande. There it frequently lives in the sides of the large deep wells.—(Couch.)

20. BUBO VIRGINIANUS, Bon. (p. 49.)—Great Horned Owl.

4613. Colorado river, Cal. A. Schott.—9157. Devil's river, Tex. Dr. Kennerly.—4137. Monterey, Mex. Lt. Couch.

My specimen was procured in the cañon of the river, where there was heavy live-oak (*Quercus virens*) timber. It seemed, however, to live indifferently among the trees and the high and precipitous cliffs. This bird is found throughout Texas and New Mexico, where there are either large trees or deep and dismal cañons, affording a secure hiding place during the day.—(Kennerly.)

21. SCOPS McCALLI, Cassin. (p. 52.)—Texas Screech Owl.

PLATE I.

9171. Texas. September 3, 1853. A. Schott.

22. ATHENE HYPUGAEA, Bon. (p. 59.)—Prairie Owl.

9164. Fort Davis, Tex. J. H. Clark.—El Paso. J. H. Clark.—4136. Tamaulipas, Mex. Lt. Couch.

Seen only in the prairie dog town, and, in conjunction with the rattlesnake, feeding on the young prairie dogs.—(Clark.)

23. ATHENE CUNICULARIA, Molina. (p. 60.)—Burrowing Owl.

4614. San Diego, Cal. A. Schott.

24. RHYNCHOPSITTA PACHYRHYNCHA, Bon. (p. 66.)—Thick-billed Parrot.

Rio Grande, Texas. J. W. Audubon.

25. TROGON MEXICANUS, Swains. (p. 69.)—Mexican Trogon.

PLATE II.

4338. Boquillo, New Leon, Mex. Lt. Couch, (138.)—4339. Do. (145.)

26. GEOCOCCYX CALIFORNIANUS, Baird. (p. 73.)—Chaparral Cock.

6184. Rio Grande, N. M. A. Schott.—Ringgold Barracks, Tex. J. H. Clark.—6177. Eagle Pass, Texas. A. Schott.—4576. Fort Yuma, Cal. A. Schott.—4053. ♀ Tamaulipas, Mex. March, 1853. Lt. Couch, 87.

This bird is called *Correr del Paisano* by the Mexicans, usually shortened into *Paisano*. Found throughout Texas and west of Rio Grande. At times it seems exceedingly stupid and suffers itself to be knocked over with a stick; and again it would require a greater speed than that of a mule to overtake it. When alarmed it erects its crest and cocks up its long tail, but in the act of running it hangs as if it was a weight to carry. Its feeding upon the snail is a well established fact, and indications of it are seen at every hand on the lower Rio Grande. It does not extend its wings when running, nor did I ever see it attempt to fly. Is said to be carnivorous; the margins of lakes are a favorite resort.—(Clark.)

This species is generally solitary, never in flocks. Usually moves at a slow pace; but if frightened, runs with great rapidity. A great enemy of the rattlesnake. It often meets that scourge in pitched battle, spreading its wing as a foil to receive the dart of the opponent, at the same time giving a sharp blow with its powerful beak. It thus quickly discomfits and kills its antagonist.—(Couch.)

27. PICUS HARRISII, Aud. (p. 87.)—Harris' Woodpecker.

4589, ♂; and 6080, ♀. Santa Isabel, Cal. November 26, 1854. A. Schott, (17.)

28. PICUS SCALARIS, Wagler. (p. 94.)

PLATE III.—*Male and Female.*

6106. ♀. Boca Grande, Mex. Dr. Kennerly, 35.—6107. ♂. Espia, Mex. Dr. Kennerly, 52.—4594. ♀. Colorado river, Cal. A. Schott, 40.—4605. ♂. Gila river, New Mex. Dec. 24, 1854. A. Schott, 54.—6114. ♂. Rio Grande, Tex. J. H. Clark, 27.—6113. ♀. San Pedro, Tex. Sept. 10, 1853. J. H. Clark.—6103. ♂. Texas. Do., 19.—6105. ♂. Tamaulipas, Mex. Lt. Couch.—4040. ♀. New Leon, Mex. Do., 76.—4039. Do.

Not uncommon in the vicinity of Boca Grande; generally found wherever there were large trees.—(Kennerly.)

29. CENTURUS FLAVIVENTRIS, Sw. (p. 110.)—Yellow-bellied Woodpecker.

PLATE IV.—*Male and Female.*

6125, 6126. Eagle Pass, Tex. A. Schott.—6122, 6123, 6124. Ringgold Barracks. July, 1853. J. H. Clark.—4036. ♂. Matamoras, Mex. March 1, 1853. Lt. Couch.

This species, though abundant on the lower Rio Grande, is shy. It keeps chiefly about the mezquite.—(Clark.)

Very common throughout Tamaulipas.—(Couch.)

30. CENTURUS UROPYGIALIS, Baird. (p. 111.)—Gila Woodpecker.

4568, 6129. ♀. Gila river, Cal. A. Schott, 22.

31. MELANERPES FORMICIVORUS, Bonap. (p. 114.)—California Woodpecker.

4606. Santa Isabel, Cal. December 26, 1854. A. Schott.—6147. Los Nogales, Mex. June, 1856. Dr. Kennerly.—6149 and 6148. Copper Mines, New Mex. J. H. Clark.—4033. ♂. (162) and 4034 (196.) New Leon, Mex. 1853. Lt. Couch.

These appeared in great numbers about the Copper Mines early in the fall, and seemed to feed principally among the oak. By stationing myself near one of their resorts, I could shoot down any number, one by one, without driving them off; and once or twice, when a wounded one would struggle and make efforts to get off, and be some time falling to the ground, the rest would follow it, occasionally striking it and flying round and round it, as if examining into his case without comprehending the cause.—(Clark.)

In the recesses of the Sierra Madre this bird was quite common and tame. It generally resorts to high trees to find its food. Among the natives it is held in high estimation for its supposed medicinal properties. It is taken (dried) in a tea, used in cases of pulmonia and heart disease. Not seen east of the Sierra Madre.—(D. N. Couch.)

This bird was first observed in the vicinity of Santa Cruz, where it was very common on the mountain slopes, always preferring the tallest trees. It was here very shy, and it was with some difficulty that a specimen could be procured.—(Kennerly.)

32. COLAPTES MEXICANUS, Swains. (p. 121.)—Red-shafted Flicker.

4041. ♀. Saltillo, Mex. May, 1853. Lt. Couch—6159. San Elziario, Tex. Dr. Kennerly. December, 1854.

First seen in the high plateaus of Agua Nueva, Coahuila. In habits seemed to be identical with the analogous species from eastern New York.—(Couch.)

Not an uncommon bird in this locality. At this season generally found solitary. Wild and cunning.—(Kennerly.)

33. COLAPTES CHRYSOIDES, Malh. (p. 125.)

? 4569. Boundary line. A. Schott.

34. TROCHILUS COLUBRIS, Linn. (p. 131.)—Ruby-throated Humming Bird.

3962. Brownsville, Tex. Lt. Couch.—3963. Santa Caterina, Mex. Lt. Couch.

35. TROCHILUS ALEXANDRI, Bourc. (p. 133.)—Black Chinned Humming Bird.

PLATE V.—Fig. 3.—*Male.*

Not uncommon in southern California.

36. SELASPHORUS RUFUS, Swains. (p. 134.)—Red-backed Humming Bird.

6067. El Paso, Tex. J. H. Clark.

37. SELASPHORUS PLATYCERCUS, Gould. (p. 135.)—Broad-tailed Humming Bird.

PLATE V.—Figs. 1, 2.—*Male and Female.*

6066. ♂. El Paso, Tex. J. H. Clark.

38. ANTROSTOMUS NUTTALLI, Cassin. (p. 149.)—Nuttall's Whippoorwill.

6002. ♀. Rio Mimbres, New Mex. J. H. Clark.

From the way in which this bird flies, and particularly its rising and striking, it reminded me so much of the woodcock, that before obtaining a specimen, I thought it belonged to that family. It was not seen east of the Rio Grande, but I found it at various points west as far as Santa Cruz, the westernmost point reached by me. Not abundant, and usually solitary, occasionally

two were flushed together. Found usually in the tall grass of the valley, sometimes on the plains. There was but one observed instance of its alighting in a bush, most frequently pitching into the grass at short distances, no matter how often it was frightened up.—(Clark.)

39. CHORDEILES HENRYI, Baird. (p. 151.)—Night Hawk.

?6013. Los Nogales, Sonora. June, 1855. Dr. Kennerly, 83.

Very common in this vicinity; coming in great numbers around the camp late in the afternoon; circling round and round, and approaching the earth nearer and nearer with the declining sun.—(Kennerly.)

40. CHORDEILES TEXENSIS, Lawrence. (p. 154.)—Texas Night Hawk.

PLATE VI.

6009. Ringgold Barracks, Tex. July, 1853. J. H. Clark.—6010 and 6012. Eagle Pass, Tex. A. Schott.—4577. Colorado river, Cal. A. Schott.

At Ringgold Barracks in the month of June; could be seen sitting about during the heat of the day, when it was easily approached. During the hotter days it would not sally forth in quest of food till late in the evening. On one occasion, near El Paso, I saw these birds so thick over a mud hole, that had given birth to myriads of insects, that I felt that a discharge of mustard seed shot into their midst would be a wanton destruction. This bird was not known to make the swoop and hoarse sound so common to our bull bat, nor does it fly so high.—(Clark.)

41. CERYLE ALCYON, Boie. (p. 158.)—Belted King-fisher.

3960. Tamaulipas, Mex. Mar. 1853. Lieut. Couch—4587. Colorado river, Cal. A. Schott.

42. CERYLE AMERICANA, Boie. (p. 159.)—Texas King-fisher.

PLATE VII.

7102 ♀ and 7103 ♂, Western Texas. J. H. Clark, 9.

43. MOMOTUS CAERULICEPS, Gould. (p. 161.)—Saw-bill.

PLATE VIII.

4337 ♂, Boquillo, New Leon, Mex. Lieut. Couch, 141.

44. PACHYRHAMPHUS AGLAIAE, Lafres. (p. 164.)—Rose-throated Flycatcher.

PLATE IX, fig. 1, male.

4024 ♂ and 4025 ♂, San Diego, New Leon. Lieut. Couch.

45. BATHMIDURUS MAJOR, Cabanis. (p. 165.)

PLATE IX, Fig. 2, female.

4026. Boquillo, New Leon, Mex., April, 1853 ♀. Lieut. Couch, 150.

46. MILVULUS FORFICATUS, Sw. (p. 169.)—Scissor-Tail.

7337. Eagle Pass. A. Schott.—7382. Lower Texas. J. H. Clark.—3997. Tamaulipas, Lieut. Couch.

Usually called Scissor-tail, sometimes Bird of Paradise. Not occurring west of the valley of the Rio Peços. Always seen following one another through the air, or perched upon some solitary twig. In its gyrations, the scissors are always more or less expanded and impress one with the idea of balancers. Their nests were built of sticks, lined on the inside though not very softly with grass, invariably on dry limbs of the mesquite. Contained from 3 to 5 eggs, speckled; and more than one pair

always seem to have interest in the same nest, over which they are very watchful and give proof of courage when interfered with, by darting at the intruder. Their note short and sharp, without much variation, can be heard at a good distance. The Mexicans imagine that they live upon the brains of other birds.—(Clark.)

This bird is rather shy, but of very lively disposition—sometimes three or four are seen in company, evidently preferring the thinly wooded prairies to close thickets.

In beauty it is considered the queen of all birds found in Northern Tamaulipas. This superiority is not owing to the brilliancy of plumage, for in that it is excelled by several species, but to the inimitable grace and charm of its flight—rising from the topmost branch of some Acacia, it seems to float rather than fly—then descending perpendicularly it retakes its position uttering its usual note. Not seen west of Cadereita.—(Couch.)

47. TYRANNUS VOCIFERANS, Swains. (p. 174.)—Cassin's Fly-catcher.

PLATE X.

4579. Colorado river, Cal. A. Schott.—7204, Los Nogales, Mex., Jan., 1855. Dr. Kennerly.

48. TYRANNUS COUCHII, Baird, (p. 175.)—Couch's Fly-catcher.

PLATE XI, Fig. 1.

4001 ♂ New Leon, Mex. Lieut. Couch.—4002. San Diego, Mex. March, 1853.—4003 ♂, Lieut. Couch. April, 1853. San Diego, Mex.

The tail of *T. melancholicus*, is represented on plate XI, fig. 2, for comparison.

Very common and noisy; found among the large trees of gardens and luxuriant river bottoms.—(Couch.)

49. MYIARCHUS MEXICANUS, Baird, (p. 179.)—Ash-throated Fly-catcher.

4608. Colorado bottom, Cal., March 31, 1854. A. Schott, 38.—4588. Gila river, N. M., Dec. 31, 1854. A. Schott, 38.—7208, Los Nogales, Mex., June, 1853, Dr. Kennerly.—7211 ♂ Frontera, Tex. J. H. Clark, 32.—7213. Eagle Pass, Tex. A. Schott.—7212 ♀, Saltillo, Coahuila, Mex., May, 1853. Lieut. Couch, 221.

Observed most abundantly in damp places, or near the water.—(Clark.)

Found among the mesquite bushes.—(Couch.)

Very common in the vicinity of Los Nogales. When two are together they make continually a loud chattering noise.—(Kennerly.)

50. MYIARCHUS LAWRENCII, Baird, (p. 181.)—Lawrence's Fly-catcher.

PLATE IX.—Fig. 3.—*Female.*

10028 ♀. San Diego, New Leon. Spring, 1853. Lt. Couch, 110.

Has a pleasant note.—(Couch.)

51. SAYORNIS NIGRICANS, Bonap. (p. 183.)—Black Fly-catcher.

7214 ♀, Espia, Mex. 1855. Dr. Kennerly, 54.—4004, ♂ Cadereita, Mex. April 1853. Lt. Couch—4005, ♀ do.

Found at Cadereita under the high banks of the stream which supplies the town with water; its habits are much the same as those of the Phœbe bird (Sayornis fuscus.) Its nest was probably in the bank.—(Couch.)

The habits of this bird were not observed to differ from those of the *Pyrocephalus rubineus*. They were observed in the same vicinity, feeding alike on insects and having the same motions.—(Kennerly.)

52. SAYORNIS FUSCUS, Baird, (p. 184.)—Pewee.

4009. Brownsville, Tex. February, 1853. Lt. Couch, 22.—4008 ♀, Tamaulipas, Mex. March. Lt. Couch, 92.

53. SAYORNIS SAYUS, Baird. (p. 185.)—Say's Fly-catcher.

7230. Copper Mines, New Mex.; (Fort Webster.) J. H. Clark.—4602. Santa Isabella, A. Schott, 18.—7231 ♂ Espia, Mex. March 1, 1855. Dr. Kennerly, 55.

Particularly abundant about the Copper Mines. One of the shafts near the fort, and which was partially filled up, served as a sink hole for all the offal of the town, and around this a dozen or more of these birds could always be seen in pursuit of flies and insects that this sink hole had attracted or given birth to. Their sudden darting from their perch and instantaneous return is not always attended with the destruction of an insect; for this seems to be done at times apparently for amusement or exercise.—(Clark.)

This bird was rare and very shy. Its habits the same as the others of the same genus.—(Kennerly.)

54. CONTOPUS RICHARDSONII, Baird. (p. 189.)—Short-legged Pewee.

7235. El Paso, Tex. J. H. Clark.—7251, ♂. Monterey, Mex., May, 1853. Lt. Couch, 212.

55. EMPIDONAX PUSILLUS, Cab. (p. 194.)

7244. Los Nogales, Mex. June, 1855. Dr. Kennerly 74.—7252 ♂. Rio Nasas, Durango. June, 1853. Lt. Couch, 240.

56 EMPIDONAX OBSCURUS Baird. (p. 200.)

PLATE XI.—Fig. 3.

7234 ♂? and 7237 ♂. El Paso, Tex. C. Wright.

57. PYROCEPHALUS RUBINEUS, Gray. (p. 201.)—Red Fly-catcher.

7224 ♂. Fort Yuma, Cal. A. Schott—7222. ♂ Boca Grande, Mex. March, 1855. Dr. Kennerly, 44.—7232. ♀ Espia, Mex. do. 53.—7221. ♂ San Bernardino, Mex. May, 1855. Do. 70.—4012. ♂ Charco Escondido, New Leon, Mex. March, 1853. Lt. Couch, 70.—4013. ♀ Santa Caterina, Mex. April, 1853. Do. 181.

Habits quiet; male precedes the female by several weeks; evidently winters south of Monterey.—(Couch.)

Often observed at various points on the road from Boca Grande to Los Nogales. It generally selects its perch on the topmost branch of some bush or tree, awaiting the approach of its insect food, when it sallies out to capture it; sometimes beautifully poising itself in the air, while its bright plumage glistens in the sun like some richly colored flower.—(Kennerly.)

58. TURDUS NANUS, Aud. (p. 213.)—Dwarf Thrush.

8170. Frontera, Texas. C. Wright.

59. SIALIA MEXICANA, Sw. (p. 223.)—Western Blue Bird.

4575. Gila river, New Mexico. A. Schott 24.—4020, ♀. Saltillo, Mexico. May, 1853. Lieut. Couch.

Only seen in the mountains of Aqua Nueva, at an elevation of 7,000 feet. Habits apparently the same or similar to those of *S. sialis*.—(Couch.)

60. SIALIA ARCTICA, Sw. (p. 224.)—Rocky Mountain Blue Bird.

7608. Espia, Mexico. March, 1853. Dr. Kennerly.

Frequently observed at different points along the Corralitos river, frequenting the vicinity of the camp early in the morning. Sometimes in pairs, and at other times four or five or more associated.—(Kennerly)

61. REGULUS CALENDULA, Licht. (p. 226.)—Ruby-crowned Wren.

7172. Espia, Mex. March, 1855. Dr. Kennerly, 63.—7174. Boca Grande, Mex. do. 43.

Observed in pairs frequenting the cotton-wood trees (*Populus*) and feeding among its flowers and tender buds. Very active, passing rapidly from branch to branch.—(Kennerly.)

62. ANTHUS LUDOVICIANUS, Licht. (p. 233.)—Tit Lark.

7931 ♀. Espia, Mexico. March, 1855. Dr. Kennerly, 57.

Observed only at Espia, and there very rare. Seen early in the morning in the vicinity of or immediately on the shore of the river busily searching for food. In its motions on the ground it somewhat resembles the common meadow lark (*Sturnella neglecta*). While walking from point to point its body continually performs a bowing motion.—(Kennerly.)

63. GEOTHLYPIS TRICHAS, Cabanis. (p. 241.)—Maryland Yellow-throat.

3990 and 3992. Brownsville, Texas. Lieut. Couch.

64. GEOTHLYPIS MACGILLIVRAYI, Baird. (p. 244.)—Macgillivray's Warbler.

3988, 3989. Monterey, Mex., May, 1853. Lieut. Couch, 205, 213.

Only seen on the slopes and ravines of the Sierra Madre, near Monterey.—(Couch.)

65. ICTERIA LONGICAUDA, Lawrence. (p. 249.)—Long-tailed Chat.

8175. Frontera, May 10, 1852. Charles Wright.—3978 ♂. New Leon, Mexico, March, 1853. Lieut. Couch, and 3979 ♂ do.

No note but that of a feeble chirp observed; found among low bushes.—(Couch.)

66. HELMINTHOPHAGA CELATA, Baird. (p. 257.)—Orange-crowned Warbler.

3994. Brownsville, Tex. Lieut. Couch.—3945 and 3993. Tamaulipas, Mex. Do. 50 and 41.

Generally seemed to seek its food and make its home among the low shrubbery.—(Couch.)

67. SEIURUS LUDOVICIANUS, Bonap. (p. 262.)—Long-billed Water Thrush.

4021 ♀. Tamaulipas, Mexico, March, 1853. Lieut. Couch, 93.

Only one of the species seen; it appeared to have been attracted to the tank at La Coma for water.—(Couch.)

68. DENDROICA VIRENS, Baird. (p. 267.)—Black-throated Green Warbler.

3987. China, Tamaulipas, Mexico, March, 1853. Lieut. Couch.

69. DENDROICA AUDUBONII, Baird. (p. 273.)—Audubon's Warbler.

7651. Janos, Mexico, April, 1855. Dr. Kennerly, 67.—7652. Boca Grande, Mexico, March, 1855; do. 34.—7653. San Bernardino; do. 69.

When observed, frequenting the cotton-wood trees, preferring the topmost branches, and apparently feeding on insects among the young and tender buds. Not very common at Boca Grande. Observed again at Janos and at San Bernardino, in Sonora.—(Kennerly.)

70. DENDROICA AESTIVA, Baird. (p. 282.)—Yellow Poll.

7644. Frontera, Texas. C. Wright.

71. DENDROICA SUPERCILIOSA, Baird. (p. 289.)—Yellow-throated Warbler.

3986. ♀ Tamaulipas, Mexico, 1845. Lieut. Couch, 74.

72. MYIODIOCTES PUSILLUS, Bonap. (p. 293.)—Green Black-cap Fly-catcher.

7675 ♂; 7676 ♂; 7677 ♀; May 5, 1852; Frontera. Charles Wright.—7685 ♀. Frontera. J. H. Clark.—3982 ♀. Monterey, Mexico. Lieut. Couch, 207.—3981 ♀, do. 214—and 3980 ♀; May, 1853, do.

Seemed to have a feeble voice; was most abundant in the mountains.—(Couch.)

73. SETOPHAGA PICTA, Swainson. (p. 298.)

4014 ♂. Boquillo, New Leon, Mexico; April, 1853. Lieut. Couch, 144.

Only seen on the eastern mountain slopes near Boquillo. In the forests it was found busily seeking its food among the limbs of the largest trees, quite lively, and shy.—(Couch.)

74. PYRANGA AESTIVA, Vieillot. (p. 301.)—Summer Red Bird.

8265 and 8266 ♀. San Antonio, Texas. J. H. Clark.—4071 ♀. Brownsville, Texas; February 11. Lieut. Couch.—4072 ♂. New Leon, Mexico. Do.—4070 ♀. Rio Nasas, Mexico; June, 1853, do.

Usually seen in parties of two or three, and not unfrequently in company with birds differing from it in type and habits. Occurring most abundantly in the thicker vegetation of the Rio Grande valley. In summer season its principal food is the fruit of the Opuntia. Flies but a short distance at a time for the most part; prefers clumps of chapparal, and does not habitually frequent the ground.—(Clark.)

From Texas to Durango. No peculiar habits observed.—(Couch.)

75. HIRUNDO HORREORUM, Barton. (p. 308.)—Barn Swallow.

3956. San Diego, New Leon, Mexico; August 1, 1853. Lieut. Couch, 124.

76. HIRUNDO BICOLOR, Vieillot. (p. 310.)—White-bellied Swallow.

4663 ♂. Matamoras, Mexico. Lieut. Couch.

77. HIRUNDO THALASSINA, Swainson. (p. 311.)—Violet Green Swallow.

3954 ♂, and 3955 ♂. Saltillo, Mexico; spring of 1853. Lieut. Couch, 229 and 230.

78. COTYLE SERRIPENNIS, Bonap. (p. 313.)—Rough-winged Swallow.

3957 ♀. New Leon, Mexico; April, 1853. Lieut. Couch, 131.

79. PROGNE PURPUREA, Bon. (p. 314.)—Purple Martin.

3952 ♂. Coahuila, Mexico; May, 1853. Lieut. Couch, 231.

80. AMPELIS CEDRORUM, Baird. (p. 318.)—Cedar Bird.

3958 ♀. Tamaulipas, Mexico; March 20, 1853. Lieut. Couch, 89.—3959. New Leon, Mexico; April, 1853; do. 155

81. PHAINOPEPLA NITENS, Sclater. (p. 320.)

8273 ♀. Fort Yuma; November 25. A. Schott. 27.—8279. Fort Yuma. A. Schott.—4591. Gila river, N. M. A. Schott. 27.—4592 ♀. Gila river, N. M. A. Schott. 22.—4564. Cook's Well, Cal. A. Schott, 21.

Very common at Los Nogales.—(Kennerly.)

82. COLLYRIO EXCUBITOROIDES, Baird. (p. 327.)—White-rumped Shrike.

8718. San Elizario, Texas; December 15. J. H. Clark.—8716. El Paso, Texas, do.—4572. Gila river N. M. A. Schott.—8720. Fort Yuma, Cal. do.

Shy, and not very abundant; flies a long distance at a time when pursued. Solitary; occasionally in pairs. It alights on topmast branches, usually resting quietly in that position till frightened off.—(Clark.)

83. VIREO OLIVACEUS, Vieill. (p. 331.)—Red-eyed Fly-catcher.

6813 ♂. Devil's river, Texas. J. H. Clark, 16.

84. VIREO FLAVOVIRIDIS, Cassin. (p. 332.)

3776 ♂ and 3977 ♂. Monterey, Mexico. Lieut. Couch.

85. VIREO BELLI, Aud. (p. 337.)—Bell's Vireo.

6817 ♂. Western Texas. J. H. Clark.

86. VIREO ATRICAPILLUS, Woodh. (p. 337.)—Black headed Fly-catcher.

6818 ♂. San Pedro river, Texas. J. H. Clark, 21.

87. VIREO NOVEBORACENSIS, Bonap. (p. 338.)—White-eyed Vireo.

3972. Brownsville, Texas. Lieut. Couch.

This little bird fills the chapparal with his melodious song.—(Couch.)

88. VIREO HUTTONI, Cassin. (p. 339.)—Hutton's Fly-catcher.

3973 ♂. Monterey, Mexico. Lieut. Couch.

Very rare; found in the mountains. Has a soft delicate note.—(Couch.)

89. MIMUS POLYGLOTTUS, Boie. (p. 334.)—Mocking Bird.

4017. Brownsville, Texas. Lieut. Couch, 2.—8163, 8166. Eagle Pass, Texas, 1852. A. Schott.—4561. Fort Yuma, Cal. A. Schott, 26.—8165? Gila river. December, 1854, do.

Besides being the most musical, is the most conspicuous and most generally distributed bird in Texas. Equally abundant in the valleys or on the plains. Unlike other thrushes, these birds are always disposed to fight, not only among themselves, but attacking indiscriminately all others that come in their way. The nest is made of very coarse sticks, rather loosely laid, in some quiet place not far from the ground. Maximum number of eggs, five. More than one pair frequently seem to have an interest in the same nest.—(Clark.)

More or less abundant to the Sierra Madre.—(Couch.)

90. OREOSCOPTES MONTANUS, Baird. (347.)—Mountain Mocking Bird.

4019 and 4018 ♀. Tamaulipas, Mexico. Lieut. Couch, 108.—8132 ♀ and 8133 ♂. March, 1855. Dr. Kennedy, 50 and 49.—4562. Gila river, N. M. A. Schott, 39.

Seems to live among the low bushes and on the ground—quiet and sparrow-like in its habits.—(Couch.)

In habits this bird very closely resembles the common robin (*Turdus migratorius.*) Frequently observed in pairs, running rapidly over the ground, actively searching for insects.—(Kennerly.)

91. HARPORHYNCHUS LECONTII, Bonap. (p. 350.)—Leconte's Mocking Bird.

PLATE XII.

Found at Fort Yuma.

92. HARPORHYNCHUS CURVIROSTRIS, Cabanis. (p. 351.)

PLATE XIII.

7101. Eagle Pass, Texas. A. Schott.—7200 ♂. Ringgold Barracks, Texas. J. H. Clark.

The nest is similar to that of the *Mimus polyglottus*, but finer and more compact, and is oftener found among the Opuntia than elsewhere. Quiet and rather shy, keeping in the clumps of the chapparal; makes much noise in flying for a bird of its size. My tent at Ringgold Barracks was pitched under a *Como* tree, in which there was a nest of these birds. At first they were shy, and were disposed to abandon their nest, but soon became accustomed to their new neighbor, and went on in their nidification.

This nest seems to have been judiciously selected; for during this season the *Como* black fruit, somewhat in size and shape of a thimble, with a pleasant milky pulp, constituted their principal food. Eggs are finely speckled; the maximum number, five.—(Clark.)

From Brownsville to Durango; at the former place it had paired in February; was exceedingly tame and gentle in its habits. Its note or song is exceedingly melodious and withal very attractive; perched on the topmost bough of the sweet flowering Mimosa tree, the male, in the presence of his consort, pours forth a volume of most enchanting music.—(Couch.)

93. HARPORHYNCHUS LONGIROSTRIS, Cabanis. (p. 352.)

PLATE XIV.

4016. ♂. Brownsville, Texas. Lieut. Couch.—8139. Lower Rio Grande. A. Schott.

94. CAMPYLORHYNCHUS BRUNNEICAPILLUS, Gray. (p. 355.)

7148. Ringgold Barracks, Texas. J. H. Clark.—3966. ♂. Monterey, Mexico. Lieut. Couch.—7151. Fort Yuma, California. A. Schott.

Has apparently a rich powerful song. Nest very large, composed of grass lined with feathers, built among the prickly pear.—(Couch.)

95. CATHERPES MEXICANUS, Baird. (p. 356.)—White-throated Wren.

3968. Patos, Coahuila, Mexico. Lieut. Couch, 236.—3969. ♂. New Leon, Mexico. Lieut. Couch, 175.

Found among the precipitous cliffs of the Sierra Madre cañons, away from the haunts of men, seeking its food and probably making its nest in the rocky crevices generally beyond the possibility of access. Its note is rich and clear, making the passes echo and re-echo with its silvery melody. Here it was never seen away from its rocky home, but at Patos, in Coahuila, a specimen was taken in the suburbs of the city.—(Couch.)

96. SALPINCTES OBSOLETUS, Cab. (p. 357.)—Rock Wren.

7158 ♀. El Paso, Mexico, December, 1854. Dr. Kennerly, 15.—7162 ♂ do., May, 1852; do.—3967, Patos, Coahuila. Lieutenant Couch, 238.

Found among the low dwarf bushes of the sandstone ranges near Patos, Coahuila; general habits sparrow-like; has the grating wren noise, together with a varied song of great sweetness.—(Couch.)

Found in the vicinity of the Rio Grande among the bushes. Flight short, the bird generally soon alighting on the ground and running off very rapidly.—(Kennerly.)

97. THRYOTHORUS BERLANDIERI, Couch. (p. 362.)

7122 ♀. Boquillo, New Leon, April, 1853, (142,) and 7121, San Diego, Mexico, March, 1853, 123, Lieutenant Couch.

98. THRYOTHORUS BEWICKII, Bonap. (p. 363.)—Bewick's Wren.

7127. Los Nogales, Mexico, January, 1855, Dr. Kennerly—7131 ♀, Devil's river, Texas, J. H. Clark, 18.—7130, New Leon, Mexico, April, 1853, Lieutenant Couch, 158.

At Santa Rosalio (41) the bird was found early in March flying among the low prickly pear seeking its food. The natives told me it laid its eggs inside of their cabins under the rafters, wherever it could find a place to deposit eggs, without the trouble of making a nest.

At Guaypuco, New Leon, (158,) had a nest in the thatched roof quite elaborately constructed. Its varied song was one of the sweetest I had heard in the country.—(Couch.)

99. TROGLODYTES PARKMANNI, Aud. (p. 367.)—Parkmann's Wren.

7193 ♂. Charco Escondido, Mexico. Lieutenant Couch, 76.

100. POLIOPTILA CAERULEA, Sclater. (p. 380.)—Blue-gray Fly-catcher.

7193 ♀ and 7194 ♀ an Mountains, Texas, J. H. Clark.—3985 ♂ and 3984 ♀. Org Tamaulipas, Mexico. Lieutenant Couch.

101. POLIOPTILA PLUMBEA, Baird. (p. 382.)

7187 ♀. Boca Grande, Mexico, March, 1855. Dr. Kennerly, 38.

When the specimen was procured only two were found together, a mile or more from the river, on the hills among the bushes Very active and restless, continually in motion.—(Kennerly.)

102. LOPHOPHANES ATRICRISTATUS, Cassin. (p. 385.)—Black crested Tit.

3974 ♂. New Leon, Mexico, Lieutenant Couch, 96, and 3975 ♀, do., 97.

This species was found very common from near China, on the San Juan, into the Sierra Madre. It is a lively bird, with a most perfect whistle of one note.—(Couch.)

103. LOPHOPHANES WOLLWEBERI, Bon. (p. 386.)

PLATE XV, fig. 1.

6794 ♀. Copper Mines. J. H. Clark, 3.

104. PSALTRIPARUS MELANOTIS, Bon. (p. 396.)—Black-cheeked Tit.

PLATE XV, fig. 3.

Said to occur on the Rio Grande of Texas.

105. PAROIDES FLAVICEPS, Baird. (p. 400.)

PLATE XV, fig. 2.

6774. El Paso, December 26, 1854. Dr. Kennerly, 24.—4015. Saltillo, Mexico, Lieut. Couch, 218.

Found in the vicinity of the Rio Grande; very wild, and flying rapidly and far before alighting. Frequenting the low mesquite and Larrea bushes on the hill sides.—(Kennerly.)

106. EREMOPHILA CORNUTA, Boie, var. CHRYSOLAEMA, Wagler. (p. 403.)—Sky Lark.

8726. Frontera, May, 1852. C. Wright.—4097 ♂, Saltillo, Mexico, May, 1853. Lieutenant Couch.

Called by the Mexicans *llaneros*, meaning a bird that lives on the plains; it is only seen on the open and arid plains; by June it is in flocks.—(Couch.)

107. CARPODACUS FRONTALIS, Gray. (p. 415.)—House Finch.

6426 ♂. Frontera, Mexico, May 6. C. Wright.—4084 ♀ and 4085, Monterey, Mexico, April, 1853. Lieutenant Couch, 186.

First seen in the city of Monterey, where it lived in security, its lively note and social disposition making it a welcome visitor in the gardens of the city.

It was found in considerable numbers in the vicinity of dwellings throughout the passes of the Sierra Madre. In the court-yard of the Hotel de Monterey I noticed that it often came to drink from the water bucket by the well.—(Couch.)

108. CHRYSOMITRIS MEXICANA, Bonap. (p. 423.)—Mexican Goldfinch.

PLATE XVI, fig. 1.

4077. Santa Catarina, New Leon, Mexico, April, 1853. Lieutenant Couch, 183.—6396 ♀. Agua Nueva, Coahuila, Mexico, May, 1853. Lieutenant Couch, 234.—4078 ♀ Parras, Mexico, June 1, 1853, do.

This little bird was only seen in the vicinity of water, generally among the branches of the ornamental trees of the almedas and gardens.—(Couch.)

109. PASSERCULUS ALAUDINUS, Bonap. (p. 446.)

4340. Brownsville, Texas, February, 1853. Lieutenaat Couch.—4341 ♂ and 4344. Tamaulipas, Mexico, March, 1853, do.

110. POOECETES GRAMINEUS, Baird. (p. 447.)—Grass Finch.

4343 ♂. Tamaulipas, Mexico, August, 1853. Lieutenant Couch, 56.—4344 ♀, do., March, 1853, 44.—6220. Boca Grande, Mexico, March, 1855. Dr. Kenuerly, 37.—6221. Espia, Mexico, do.

Frequently observed in flocks on the hill sides, feeding among the Larrea, Obione, and other bushes; rarely seen in the immediate vicinity of the river.—(Kennerly.)

111. COTURNICULUS PASSERINUS, Bonap. (p. 450.)—Yellow-winged Sparrow.

6333. Los Nogales, Mexico, June, 1855. Dr. Kennerly, 85.

Not often seen; generally in small flocks of four or five.

112. CHONDESTES GRAMMACA, Bonap. (p. 456.)—Lark Finch.

4083 ♀. New Leon, Mexico. Lieutenant Couch, 147.—4590. Colorado river, California, December 30, 1854. A. Schott, 31.

Found in the underbrush; song varied and extremely pleasing, equal to that of the canary, with one or two rare notes.—(Couch.)

113. ZONOTRICHIA LEUCOPHRYS, Swains. (p. 458.)—White-crowned Sparrow.

4080 ♂ and 4082. Tamaulipas, Mexico. Lieutenant Couch, 48.—4081 ♀. Brownsville, Texas, Lieutenant Couch, 4.—6195. Frontera, Texas, May 4. A. Schott.

In flocks, at Charco Escondido, March, 1853.—(Couch.)

114. ZONOTRICHIA GAMBELII, Gambel. (p. 460.)

6200. San Elizario, Texas, December, 1854. Dr. Kennerly, 9.

Very often observed in the valleys of the Rio Grande, Corralitos, and Janos rivers. It apparently prefers the vicinity of settlements, where it was always seen in greater numbers than elsewhere.—Kennerly.

115. POOSPIZA BILINEATA, Sclater. (p. 470.)—Black-throated Sparrow.

4088 ♀. Tamaulipas, Mexico, March, 1853. J. H. Clark, 77.—6320. Ringgold Barracks, Texas, July, 1853, do.—6317 and 6319 ♀. Frontera, Texas. J. H. Clark.—6318 ♀ Frontera. May 5, 1852, do.—6316 ♂. El Paso, New Mexico, December, 1853. J. H. Clark, 17.—6315. Boca Grande, New Mexico, March, 1855. Dr. Kennerly, 42.

Abundant and widely distributed. I found them on the lower Rio Grande, but more abundantly in the middle of the continent. Prefer habitually the stunted and sparse vegetation of the sand hills and dry plains to the cotton-wood groves and willow thickets of the river valleys, where, indeed, they were never seen. They would certainly be very inconspicuous, as well from their color and habits as from size, if it were not that the male occasionally perches himself on some dry stick or topmost branch and pours forth a continuous strain of music. In some of the more barren regions, where the Creosote plant and stunted forms of the mesquite constitute the only vegetation, they may be said to be the representatives of the feathered tribes.—(Clark.)

Sparrow-like in its habits; has a low note, and keeps in close attendance upon its mate.—(Couch.)

Found on the hill sides adjacent to the Rio Grande and Corralitos rivers, feeding among the low bushes. It was quite wild; flying very rapidly for a short distance, alighting on a bush, and, immediately descending to the ground, would run off very swiftly. Two or more generally observed together.—(Kennerly.)

116. SPIZELLA PALLIDA, Bonap. (p. 474.)—Clay-colored Bunting.

4091. Tamaulipas, Mex., March, 1855. Lieut. Couch.

117. SPIZELLA BREWERI, Cassin. (p. 475.)—Brewer's Sparrow.

6357. Boca Grande, Mex., March, 1855. Dr. Kennerly, 40.—6356 ♀. El Paso, Texas, May 4, 1852. C. Wright.

Found in flocks, frequenting the hills in the vicinity of the river. Often associated with the larger sparrows.—(Kennerly.)

118. SPIZELLA ATRIGULARIS, Baird. (p. 476.)—Black-chinned Sparrow.

PLATE XVII, fig. 1.

4335 ♂. Agua Nueva, Coahuila, Mex., May, 1853. Lieut. Couch.

Found in flocks, May, 1853. Mountains of Agua Nueva, Coahuila, Mex., 223.—(Couch.)

119. MELOSPIZA MELODIA, Baird. (p. 477.)—Song Sparrow.

6226? Boca Grande, Mex., March, 1855. Dr. Kennerly, 39.

Generally found in the immediate vicinity of the river where the bushes were thickest and most impenetrable.—(Kennerly.)

120. MELOSPIZA LINCOLNII, Baird. (p. 482.)—Lincoln's Finch.

4090 ♂. Tamaulipas, Mex., March, 1853. Lieut. Couch, 55.—4089. Brownsville, Texas, ditto, 7, and 4090, ditto 9.

121. PEUCAEA CASSINII, Baird. (p. 485.)

6327. Los Nogales, Mex., June, 1855. Dr. Kennerly.

122. EMBERNAGRA RUFIVIRGATA, Lawrence. (p. 487.)

PLATE XVII, fig. 2.

6246. New Leon, Mex. Lieut. Couch.—6247. Ringgold Barracks, Texas. J. H. Clark.

123. CALAMOSPIZA BICOLOR, Bonap. (p. 492.)—Lark Bunting.

6301 and 6302. Sonora, Mex., Dr. Kennerly.—6303 ♂ and 6304 ♀. Espia, Mexico, March, 1855. Dr. Kennerly.

Sometimes occurring in flocks of hundreds; the greatest numbers were seen near Presidio del Norte. Great varieties of plumage were observed in the same flock. Seeds appeared to constitute their food. Very simultaneous in all their movements, never having observed a straggler remaining behind after the flock had started; they are the most absolutely gregarious birds I ever met with.—(Clark.)

Observed in the valley of the river early in the morning in very large flocks. During the greater part of the day they feed on the hills among the bushes. When on the wing they keep very close together, so that a single discharge of small shot will sometimes bring down twenty or thirty.—(Kennerly.)

124. GUIRACA CAERULEA, Swainson. (p. 499.)—Blue Grosbeak.

4092 ♂ and 4093 ♀. New Leon, Mex., April, 1853. Lieut. Couch, 146.—6384 ♂. Eagle Pass, Tex. A. Schott.—6382 ♂. Frontera, Mex., May, 1853. C. Wright.—6383 ♀. Zoquito, Mex. J. H. Clark.—6381. Los Nogales, Mex., June, 1855. Dr. Kennerly, 80.

First seen near Monterey. Male preceded the female; exceedingly tame.—(Couch.)

Not often seen, but when observed generally solitary, preferring the dark ravines and caffons on the mountain sides.

125. CYANOSPIZA PARELLINA, Baird. (p. 502.)

PLATE XVIII, Fig. 1.

4076. Sierra Madre, New Leon, Mex., April, 1853. Lieut. Couch, 154.

126. CYANOSPIZA VERSICOLOR, Baird. (p. 503.)

PLATE XVIII, Fig. 2.

4075 ♂. Boquillo, New Leon, Mex. Lieut. Couch, 151.

127. CYANOSPIZA CIRIS, Baird. (p. 503.)—Painted Bunting.

6272 ♂, 6273 ♀. San Antonio, Tex. J. H. Clark.—6274 ♀ and 6275 ♀. San Pedro, Tex. J. H. Clark.

This bird diminishes in number as we proceed westward. Their nest is built of very fine grass, in low bushes, and resting in the crotch of the twigs. Males were never seen about the nests; but the females are so gentle as to allow themselves to be taken off the nest, which was deliberately done on more than one occasion. The eggs are of blue, usually five in number. The male is most always seen alone, flying a long distance at a time for so small a bird.—(Clark.)

Shot among the low hedges in the suburbs of Pesqueria Grande.—(Couch.)

128. SPERMOPHILA MORELETII, Pucheran. (p. 506.)

PLATE XVI, Figs. 2, 3. (Male and female.)

4096 ♂. San Diego, New Leon, Mex., March, 1853. Lieut. Couch, 113.—4095 ♂? Monterey, Mex., April, 1853. Lieut. Couch, 163.

Was noticed busily but quietly seeking its food among the blossoms of the sweet mimosa. No note except a lively chirp.—(Couch.)

129. PYRRHULOXIA SINUATA, Bonap. (p. 508.)

4027 ♂. New Leon, Mex., May, 1853. Lieut. Couch, 209.—4028 ♂ and 4029 ♀. 47 and 59.—6366 ♀ and 6367. Ringgold Barracks, Tex., July, 1853. A. Schott.—6368. El Paso, Texas, Jan., 1855. Dr. Kennerly.

When first seen in March, (Tamaulipas,) it was in flocks, very shy, and quite difficult to approach. Not much in the open fields, but preferring the vicinity of fences and bushes; often seen in company with C. virginianus.—(Couch.)

We found this bird quite abundant in the vicinity of El Paso, but did not observe it elsewhere. It kept generally in flocks of from three to six, frequenting the hedges and fruit trees in the immediate vicinity of the houses. When approached it became very restless, flying from branch to branch and from tree to tree, uttering with great vehemence its peculiar note.—(Kennerly.)

130. CARDINALIS VIRGINIANUS, Bonap. (p. 509.)—Red Bird.

4030 ♂. Feb., 1853. Lieut. Couch, 23.—4032 ♀. Brownsville, Texas. Lieut. Couch, 12.—4031. New Leon, Mexico, April, 1853. Lieut. Couch, 127.

More or less common among the Sierra slopes of New Leon and Coahuila. Great numbers in Tamaulipas.—(Couch.)

131. PIPILO MEGALONYX, Baird. (p. 515.)

4603. Heights of San Pasqual. A. Schott, 12.—4042 ♀. Saltillo, Mex. Lieut. Couch.—6732 ♀. Copper Mines, N. Mex. J. H. Clark.

A shy, quiet bird, in woody places.—(Couch.)

132. PIPILO ABERTII, Baird. (p. 516.)

4604. Fort Yuma, Cal. A. Schott.—4578. Colorado river, Cal. Do.

133. PIPILO MESOLEUCUS, Baird. (p. 518.)

6834 ♂. Santa Catarina, Mex. April, 1853. Lt. Couch.—6835 ♀. 6828. Copper Mines, New Mex. J. H. Clark, 5.—6830. Los Nogales, Mex. June, 1855. Dr. Kennerly.

Was met in abundance in the deep valleys or cañons of the Copper Mine region; almost always in or about the thick clumps of bushes, several in company; makes less noise in scratching among leaves for food than the eastern species, nor is it so active. It is gentle, however, and easily approached.—(Clark.)

Not very common, preferring the dense bushes in the valleys. When approached it becomes very restless, flying from bush to bush, accompanying its motions with their peculiar notes.—(Kennerly.)

134. PIPILO CHLORURA, Baird. (p. 519.)—Blanding's Finch.

4609. Colorado river, New Mex. April 10, 1355. A. Schott, 60.—6242. San Elizario, Tex. December 16, 1854. Dr. Kennerly, 23.—6243. Eagle Pass, Tex. Fall of 1852. A. Schott.

A specimen was procured with some difficulty. For several successive days it was found in the same place, occupying a small clump of very thick weeds. When aroused, which was only accomplished with some effort, its flight was short, rapid and irregular. Its motions on the ground were very awkward.—(Kennerly.)

135. MOLOTHRUS PECORIS, Swains. (p. 524.)—Cow Bird.

8759. Eagle Pass, Tex. A. Schott.—8761. Los Nogales, Mex. Dr. Kennerly, 82.—4580, 4585, and 4582. Fort Yuma, Cal. A. Schott, 43, 42.—4584. Gila river, New Mex. December 6, 1854. Do. 28.

Quite common at various points on the route. Very tame, feeding in large flocks around the camp, and among the wagons and tents. Sometimes following the herd of mules, making themselves very familiar with them by perching in numbers sometimes on their backs. So tame are they that the herders often indulged in the cruel sport of killing them with their whips.—(Clark.)

136. AGELAIUS PHOENICEUS, Vieillot. (p. 526.)—Swamp Blackbird.

4048 ♀. Brownsville, Tex. February 11, 1853. Lt. Couch, 20.—4049 ♂ and 4047 ♀? New Leon, Mex. March, 1851, and April, 1853. Lt. Couch, 170 and 182.—4050. Saltillo, Mex. May, 1853. Do. 17.—8591. San Elizario. December, 1854. Dr. Kennerly, 7.—8573. Espia, Mex. Dr. Kennerly, 45.

More or less common, to Durango, generally in the vicinity of ranches and villages; but in the lower Bolson de Mapime it makes its home in the pasturage of those natural meadows.—(Couch.)

Quite common in this locality, going in flocks, feeding in the grain fields and about the settlements. Observed also at Espia, and at Janos was sometimes found in company with the saffron-headed blackbird, (*Agelaius xanthrocephalus.*)—(Kennerly.)

137. AGELAIUS GUBERNATOR, Bon. (p. 529.)—Red-shouldered Blackbird.

4599? Colorado river, Cal. A. Schott, 50.—4600? and 4598? Do.

138. AGELAIUS TRICOLOR, Bon. (p. 530.)—Red and White-shouldered Blackbird.

4601. Colorado river, Cal. December, 1854. Dr. Kennerly, 19.

139. XANTHOCEPHALUS ICTEROCEPHALUS, Baird. (p. 531.)—Yellow-headed Blackbird.

4045 ♂. New Leon, Mex. May, 1853. Lt. Couch.—4046 ♀. Do.—8570 ♂. El Paso. A. Schott.

This, mingled with two or three of its congeners, was always met with in flocks. The *Quiscalus macrourus* is an occasional companion, but its unwieldly tail and heavy flight prevents it from keeping up. More abundant in the vicinity of the coast than in the middle of the continent. There was a roost of these birds on an island in a laguna near Fort Brown. Towards sunset, and from that time till dark, they could be seen approaching this spot from all quarters. It took them about an hour to get settled down, till which time they kept up a constant chattering and change of place. I saw another of these roosts on an island of the Rio Grande, near its mouth, where the willows were so thick as to intercept vision, but each one seemed bending under the support of at least half dozen blackbirds.—(Clark.)

Found in company with the grakle and cow blackbird; note loud.—(Couch.)

Very common near Janos, and also near Santa Cruz, Sonora. Observed at the former place in the month of April going in large flocks; sometimes associated with *Agelaius phoeniceus*. Quite domestic in their habits, preferring the immediate vicinity of the houses, and often feeding in the yards along with the domestic fowls.—(Kennerly.)

140. STURNELLA NEGLECTA, Aud. (p. 537.)—Western Lark.

8611. Matamoras. Lt. Couch.—4064 ♀. Coahuila, Mex. Do.—8613. San Elizario, Tex. December, 1855. Dr. Kennerly, 19.—8614 ♂. Espia, Mex. March, 1855. Dr. Kennerly.—8615. Fort Yuma, Cal. November, 1854. A. Schott.—4573. San Diego, Cal. A. Schott.

What I supposed to be the same species was found from the Rio Grande to the high bottoms in the lower Balson de Mapinri. Its note is highly musical, contending with the *mocking bird* for a supremacy in song.—(Couch.)

141. ICTERUS AUDUBONII, Giraud. (p. 542.)—Audubon's Oriole.

4063 ♂. Charco Escondido, Tamaulipas, Mex. May. Lt. Couch, 64.—4062 ♀. Do. 63.—4059. Matamoras, Mex. Dr. Berlandier.—6713. Ringgold Barracks, Tex. J. H. Clark.

Common from the lower Rio Grande to the Sierra Madre. A strong mutual attachment shown by the sexes. It has a soft melancholy song of the notes *peut pou it*, the sweetness of which renders it a favorite as a cage bird.—(Couch.)

142. ICTERUS PARISORUM, Bonap. (p. 544.)

PLATE XIX, Fig. 1.

4056 ♂ and 4057 ○♂. Santa Catarina, New Mex. April, 1853. Lt. Couch.

First seen in the vicinity of Monterey; generally secluded, its song consisting of three or four notes; is rich and melodious.—(Couch.)

143. ICTERUS WAGLERI, Sclater. (p. 545.)

PLATE XIX, Fig. 2.

4058 ♂. Saltillo, Coahuila, Mex. May, 1853. Lt. Couch.

Believed to be the only one of the species seen; this was in Coahuila, at the ranche of Ojo Caliente, on a hot spring; quite shy and difficult to approach. Like the other Orioles, it appeared to be fond of the palm or Spanish bayonet.—(Couch.)

144. ICTERUS CUCULLATUS, Swains. (p. 546.)—Hooded Oriole.

4067 ♂. Charco Escondido. Tamaulipas, Mex. March, 1853. Lt. Couch, 83.—4066 ♂. Tamaulipas, do. 91.—4068 ♂. Do. April. Do. 159.—4069 ♀. Do. March, 1853. Do. 90.

Nest generally on, or often under, the top of the Spanish bayonet. Common in Tamaulipas and New Leon.—(Couch.)

145. ICTERUS SPURIUS, Bon. (p. 547.)—Orchard Oriole.

6707 ♀, 6708 ♀, 6712 ♂, and 6710. Western Texas. J. H. Clark.

146. ICTERUS BALTIMORE, Daudin. (p. 548.)—Baltimore Oriole.

6714. San Antonio, Texas. J. H. Clark.

Numbers of these were seen nesting in the mesquite on the prairies, at which time they were very musical, and having sometimes as many as three nests in the same tree; the nests were built of fine grass, in the tops of the branches, and interwoven among the leaves.—(Clark)

147. ICTERUS BULLOCKII, Bon. (p. 549.)—Bullock's Oriole.

6727. Guadalupe cañon. 1855. Dr. Kennerly, 68.—6723. Eagle Pass. A. Schott.

In passing through the Guadalupe cañon this bird was often seen, but at no other point on the route was it observed. It seemed to prefer the low bushes on the hill sides to the large trees. In its motions it was quick and restless, passing rapidly from bush to bush.—(Kennerly.)

148. SCOLECOPHAGUS CYANOCEPHALUS, Cab. (p. 552.)—Brewer's Blackbird.

8712. Eagle Pass, Tex. A. Schott.—8713. Santa Rosalia, Mex. Lt. Couch.

Lives about the ranches and cattle yards.—(Couch.)

149. QUISCALUS MACROURA, Swains. (p. 554.)—Long-tailed Grakle.

PLATE XX.

8553. Texas. A. Schott.—8551 and 8552. Eagle Pass, Tex. Do.

The plate represents the details of external form, of natural size.

150. QUISCALUS MAJOR, Vieill. (p. 555.)—Boat-tailed Grakle.

4044? Brownsville, Tex. Lt. Couch, 6.

151. CORVUS CARNIVORUS, Bartram. (p. 560.)—American Raven.

4563. Jamacha Ranch, Cal. A. Schott, 9.—10298. ♂. Espia, Sonora. Dr. Kennerly, 51.

Observed everywhere throughout the country. Flocks of them follow the train from point to point. Not at all shy, but often coming into the camp in search of food.—(Kennerly.)

152. CORVUS CRYPTOLEUCUS, Couch. (p. 565.)—White-necked Crow.

10300. Janos, Mex. April, 1855. Dr. Kennerly, 64.—4118 ♀. Pharco Escondido. May, 1853. Lt. Couch.

Does not seem to possess the cunning or wariness of its congeners. Found most abundantly about watering places; not habitually in great flocks, though at the head of the Limpia many were congregated and flying about the face of an immense rocky mountain wall, where they were probably nesting. Their note is coarse and less shrill than the common crow. Met with a nest in an arborescent cactus?—(Clark.)

Found in small numbers in eastern Tamaulipas, generally near ranches.—(Couch.)

Not very common, and when seen generally associated with the larger species of the same genus.—(Kennerly.)

153. CYANOCITTA CALIFORNICA, Strickl. (p. 584.)—California Jay.

4565. San Pasqual, Cal. A. Schott, 13.—8461. San Felipe, Cal. A. Schott.

154. CYANOCITTA WOODHOUSII, Baird. (p. 585.)—Woodhouse's Jay.

PLATE XXI.

Near Copper Mines.

At the Copper Mines a great many jays of this and allied species were seen, usually feeding, in parties of a dozen or more, on the piñoles and acorns. The harsh, disagreeable note of one of these wary birds is the signal of alarm for all the rest; even in their undisturbed course of feeding they go over a great deal of ground, the one in the rear advancing in front of his file leader, all the while keeping up their grating music, and thus each knowing the whereabouts of the other.

155. CYANOCITTA SORDIDA, Baird. (p. 587.)

PLATE XXII, Fig. 1.

8469. ♂. Copper Mines, N. Mex. 1851. J. H. Clark, S.

The figure is taken from an adult specimen received from Mexico, No. 8469 being immature.

156. CYANOCITTA ULTRAMARINA, Strickl. (p. 588.)—Ultramarine Jay.

PLATE XXII, Fig. 2, (bill and tail.)

4112 ♂. Monterey, Mex. Lt. Couch, 156.—4113 ♂. April, 1853. Do. 157.

Found from below Monterey west to Parras. Gregarious; jay-like in habits; three or four of them will keep a forest in an uproar. Near Guopuco a large snake (*Georgia obsoleta*) was seen, pursued by three or four of this species. The reptile was making every effort to escape from their combined attacks, and would no doubt have been killed had they had fair play. The cause of so much spite against him was discovered when, upon opening his stomach, three young, two-thirds grown, of this species was found.—(Couch.)

157. XANTHOURA LUXUOSA, Bonap. (p. 589.)—Rio Grande Jay.

8365. Rio Grande, Tex. Oct. 2, 1855. A. Schott.—8357. Matamoras. Dr. Berlandier.—4052 ♂. New Leon, San Diego. March, 1853. Lt. Couch.

Eats seeds and insects.—(Couch.)

158. PSILORHINUS MORIO, Gray. (p. 592.)

4116 ♂ and 4117 ♀. Boquillo, Mex. Lieut. Couch, 140.—4118. San Diego, Cal. Do. 109.—4114 ♀. China, N. Leon, Mex. Do. 98.

Lives in forests of high trees. Jay-like in its habits; note loud, harsh; gregarious. Though making more noise than any other bird in its neighborhood, if one is brought down by a gun, the noise hushes them at once, and the rest move off in perfect silence.—(Couch.)

159. COLUMBA FASCIATA, Say. (p. 597.)—Band-tailed Pigeon.

8741. Los Nogales, Mex. July, 1855. Dr. Kennerly, 86.—4109 ♀. New Leon, Mex. Lt. Couch.

This beautiful bird was often observed in the valleys of the Santa Cruz and Los Nogales rivers, as well as among the oaks on the adjacent hills. In the month of June they were found in small flocks of four or five, rarely more. When flying, the wings often produced a flapping noise similar to that made by the domestic pigeon.—(Kennerly.)

160. COLUMBA FLAVIROSTRIS, Wagler. (p. 598.)—Red-billed Dove.

PLATE XXIII.

4111 ♂. New Leon, Mexico, March, 1853. Lieutenant Couch.—7098 ○. Rio Grande, Texas. A. Schott.

First seen in the thick woody bottoms of the San Juan, New Leon. Quite common, but secluded; flight rapid.—(Couch.)

161. MELOPELIA LEUCOPTERA, Bonap. (p. 603.)—White-winged Dove.

4107 ♀. Tamaulipas, March, 1853. Lieutenant Couch.

162. ZENAIDURA CAROLINENSIS, Bonap. (p. 604.)—Common Dove.

4102 ♂. Tamaulipas, Mexico. Lieutenant Couch, 42.—8754. Ringgold Barracks, July, 1853.

J. H. Clark.—8757. San Elizario, Mexico, December 14, 1854. Dr. Kennerly, 8.—4560 and 4559. Colorado river, California. A. Schott.

The vicinity of Ringgold Barracks seems to be a resort of many birds of this family, for the purpose of nesting. The luxuriant development of the opuntia and other vegetation equally as impassible afford at once the means of defence. Hundreds of at least a half dozen species may be seen in the evening watering on the banks of the river.—(Clark.)

In great numbers from the Rio Grande to beyond the Sierra Madre; generally near the ranches, though often in the forests. It seems to be inclined to court society, probably for protection and food.—(Couch.)

Very abundant in the vicinity of San Elizario, going in large flocks, and feeding in the wheat and corn fields. Observed also as far west as Santa Cruz, Sonora.—(Kennerly.)

163. SCARDAFELLA SQUAMOSA, Bonap. (p. 605.)—Scaly Dove.

4110 ♀. Cadereita, New Leon, Mexico. April 18, 1853. Lieutenant Couch, 128.

164. CHAMAEPELIA PASSERINA, Swain. (p. 606.)—Ground Dove.

4105. Matamoras, Mexico. Dr. Berlandier.—4104 ♀ and 4103 ♂. Tamaulipas. Lieutenant Couch, 57 and 58.

Generally found in the forests or open fields at a distance from dwellings; flies low and for short distances, though keeping generally on the ground.—(Couch.)

165. ORTALIDA McCALLI, Baird. (p. 611.)—Chiacalacca.

4106 ♂. Boquilla, New Leon, spring of 1853. Lieutenant Couch, 137.

Does not occur higher up the Rio Grande than the vicinity of Ringgold Barracks. Inhabits the densest chapparal, which it never quits; inactive, and for the most of the time sitting about in flocks or gangs in these thickets feeding on leaves. Its Mexican name, *Chikilaka*, is, without doubt, derived from the noise with which at times it makes the valleys ring again, and may be pretty well imitated in kind, but not in strength, by putting the most stress upon the last two syllables. No sooner does one take up his song than others chime in from all quarters, till, apparently exhausted, the noise gradually dies off into an interlude, but to be again renewed. These concerts take place in the morning and evening. They are gentle and easily tamed, and are said to cross with the common dunghill fowl.—(Clark.)

Gregarious. In part or wholly seeks its food on trees.—(Couch.)

156. ORTYX VIRGINIANUS, Bonap. (p. 640.)—Partridge.

Eastern Texas.

167. ORTYX TEXANUS, Lawrence. (p. 641.)—Texas Quail.

PLATE XXIV.

9354. Devil's river, Texas, November, 1854. Dr. Kennerly, 20.—9349 ♂. Laredo, Texas, J. H. Clark.—4101. Matamoras. Lieutenant Couch.—4099 ♂. New Leon, Mexico. Lieutenant Couch.—4098. Do., May, 1853. Do., 208.

Not seen in abundance west of the valley of the Pecos, where, as well as in all southwestern Texas, they are very abundant. They are as much like the Virginia quail in habits as they are in general appearance. Nothing short of direct comparison would satisfy me that they were specifically distinct. Its note, to my ear, was absolutely identical with that of the Virginia quail. Have often been a spectator of fights among the cocks.—(Clark.)

Observed everywhere in considerable numbers from the coast to the head of Devil's river, and also along the Pecos, but further west than this was not seen. In the open prairie lands great numbers were always found early in the morning in the road. In its habits it very closely resembles the common Virginia partridge.—(Kennerly.)

168. LOPHORTYX CALIFORNICUS, Bonap. (p. 644.)—California Quail.

9396 ♂. Near San Diego. A. Schott.

169. LOPHORTYX GAMBELII, Nutt. (p. 645.)—Gambell's Partridge.

9362. San Elizario, Texas, December, 1855. Dr. Kennerly, 14.—9363, 9364, ♀. Do. 13 and 5.—9369 ♀. Colorado river, California. A. Schott.—9370 ♂, do. Dr. Kennerly.

This species was not met east of the valley of the Rio Grande, nor further south than Presidio del Norte. Unlike the *squamata*, it is very common for this species to sit on the branches of trees and bushes, particularly the male, where he bewails in notes most mournful the absence of his mate and other cares of life. They are so tame as to come about the Mexican towns, the inhabitants of which, though half-starved, never think of making an effort to capture them. It inhabits only wooded and watered regions. I believe that they will take insects or berries, indifferently, which ever first falls in the way of an empty crop. In summer they make the patches of "*Solanum?*" their home, feeding on its quite palatable berries. Unlike the *squamata* and *massena*, this quail when flushed seeks trees and hides very successfully among the branches.—(Clark.)

Was not observed until we reached the valley of the Rio Grande, and not further west than San Bernardino, Sonora. Though closely resembling in its habits the scaly partridge, (*Callipepla squamata*,) and occupying the same districts in some instances, they were never observed together.—(Kennerly.)

170. CALLIPEPLA SQUAMATA, Gray. (p. 646.)—Scaled or Blue Partridge.

9381. ♀: San Pedro. J. H. Clark.—3999 ♂, New Leon, Mexico. Lt. Couch.

This quail does not occur on the grassy prairies near the coast. My first acquaintance with it was on Devil's river, where my attention was attracted by a very peculiar note, of which I started in pursuit, thinking the noise was made by some kind of squirrel. In the valley of the lower Rio Grande they were frequently met with in covies of a dozen or more. Their food on the prairies is doubtless insectivorous, while on the lower Rio Grande it was almost impossible to obtain a specimen whose bill was not stained with the fruit of the *Opuntia*. Not shy, and would rather get out of the way by running than by flying. At no time and under no circumstances do they alight in bushes or trees. Remains of nests show them to be mere scratches in the ground and very carelessly selected. Young were met with in June and July.—(Clark.)

This species was first seen about 60 leagues west of Matamoras, not until free from prairie and bottom land; it was occasionally noticed apparently associating with the *Oxtyx texana;* general habits similar to that bird.—(Couch.)

Found everywhere where there was permanent and fresh water, from Limpia creek, Texas, to San Bernardino, Sonora. Living on the mountain sides or on the hills among the low mesquite bushes and larrea; relying apparently more upon its legs than wings, ascending the most precipitous cliffs or disappearing among the bushes with great rapidity.—(Kennerly.)

171. CYRTONYX MASSENA, Gould. (p. 647.)—Massena Partridge.

9358. Turkey creek, Tex., Nov., 1854. Dr. Kennerly, 25.—9355. Laredo, Texas. J. H. Clark.—3998 ♂ New Leon, Mex., April, 1853. Lt. Couch.

Once on flushing a covy of *Ortyx texanus*, my attention was attracted by a bird that remained behind showing no inclination to follow the rest. It attempted to hide in the grass but not to fly, and on being shot proved to be a male *massena*

It occurs in pairs or flocks, and when flushed it flies further than the Virginia quail, and does not lie so close. They may be approached within a few feet, and followed up, particularly when in pairs; running along before you like so many domestic fowls. It is quiet as well as retired; a subdued though sharp note is the only noise I ever heard it make, and that only when frightened. I have seen it pursued and all the barrels of a six-shooter fired at it without giving it alarm and finally forced to fly only by an attack of stones and clubs. It was first met in the neighborhood of San Antonio, and thence sparsely distributed, as an inhabitant both of prairies and mountains, as far westward as Sonora. It is a much wilder bird than the *squamata*; less conspicuous as also less noisy; and never seen in flocks, living about old camps, as is often the case with the latter. Its haunts are far removed from the habitation of man, and the indifference it sometimes manifests to his presence is due to its ignorance of his power and attributes. Though distributed over the same country as the *squamata*, it is not found in such barren regions as the latter frequently is—preferring those districts most luxuriantly covered with vegetation.—(Clark.)

First seen in the cañon Guapuco, 12 leagues south of Monterey; though rather shy, it seemed quite at home in the cultivated fields and stubbles of the ranches.—(Couch.)

This bird I have never seen further south in Texas than Turkey creek. In this vicinity it was very common, and also at various points thence to the Rio Grande In the valley of this river it is very rarely seen, giving way apparently to the Scaly and Gambel's partridges. West of the river it was very common as far as we travelled, wherever there was fresh and permanent water. In the valley of the Santa Cruz river, and among the adjacent hills, it was extremely abundant. In the months of June and July it was observed there, always in pairs; while in Texas, in the months of October and November, it was found in very large flocks, sometimes of various ages, from the very small and partly fledged, to the full grown bird. When

hunted it hides itself very closely in the grass, and often I have known the Mexican soldiers in Sonora to kill them with their lances by striking them either while on the ground or just as they rise. Some of these men are very expert in this business, and will kill many in the course of a day's travel.—(Kennerly.)

172. GRUS CANADENSIS, Temm. (p. 655.)—Sand-hill Crane.

4623. Colorado river, Cal., February 19, 1855. A. Schott, 46.

173. DEMIEGRETTA RUFA, Baird. (p. 662.)—Reddish Egret.

4146 ♀. Matamoras, Texas. Dr. Berlandier.

174. GARZETTA CANDIDISSIMA, Bonap. (p. 665.)—Snowy Heron.

4145 ♂. Cadereita, Mex., April, 1853. Lt. Couch, 136.

175. HERODIAS EGRETTA, var. CALIFORNICA, Baird. (p. 667.)

4610. San Diego, Cal. A. Schott.

176. ARDEA HERODIAS, Linn. (p. 668.)—Great Blue Heron or Crane.

9474. Texas. A. Schott.—4144. Tamaulipas. Lt. Couch.—9477. Boca Grande, Mexico, March, 1855. Dr. Kennerly.

Often observed along this river as well as along the Rio Grande. Always solitary.—(Kennerly.)

177. FLORIDA CAERULEA, Baird. (p. 671.)—Blue Heron.

9495. Lower Rio Grande, Tex. A. Schott.

178. BOTAURUS LENTIGINOSUS, Stephens. (p. 674.)—Bittern.

4152. Matamoras, Mexico. Lt. Couch.

179. BUTORIDES VIRESCENS, Bonap. (p. 676.)—Fly-up-the-creek.

9487 ♀. Rio Grande, May 4, 1852. J. H. Clark.—4153 ♀. Rio Nasas, Durango. Lt. Couch.—9488. Eagle Pass, Texas. A. Schott.

180. NYCTIARDEA GARDENI, Baird. (p. 678.)—Night Heron.

4149 ♂. Pesquieria Grande, N. Leon, May, 1853. Lt. Couch.

181. NYCTHERODIUS VIOLACEUS, Reich. (p. 679.)—Yellow-crowned Night Heron.

4147. Matamoras. Lt. Couch.—9481. Rio Grande, Texas, October 13, 1853. A. Schott.

182. TANTALUS LOCULATOR, Linn. (p. 682.)—Wood Ibis.

9496. Major Brown's Island, Rio Grande, October 23, 1853. A. Schott.—9497. Lower Rio Grande. Do.—4144. Matamoras. Lt. Couch.

183. IBIS ALBA, Vieillot. (p. 684.)—White Ibis.

9501. Brownsville, Texas, October 25, 1853.—A. Schott.

184. IBIS ORDII, Bonap. (p. 685.)—Glossy Ibis.

9503. Texas. A. Schott.—4142 ♀. Cadereita, Mex. Lt. Couch.—9506 ♀. Frontera, Rio Grande, Texas. C. Wright.—9504. Santa Cruza, Sonora, June, 1855. Dr. Kennerly, 71.

Quite common in this vicinity, going in large flocks and feeding only in the valley of the river in swampy places. They were found to be very tame and easily killed. Not observed elsewhere on the route.—(Kennerly.)

185. PLATALEA AJAJA, Linn. (p. 686.)—Rosy Spoon-bill.

9499. Lower Rio Grande, Texas. 1853. A. Schott.—9498. Rio Grande, Texas, do.

186. CHARADRIUS VIRGINICUS, Borck. (p. 690.)—Bull-head Plover.

4180. Tamaulipas, Mex. Lt. Couch.

71. Found feeding in the edges of the tank at Escondido.—(D N. Couch.)

187. AEGIALITIS VOCIFERUS, Cassin. (p. 692.)—Kill-deer.

4181 ♂. Near Matamoras, Mex. Lt. Couch.—6594. A. Schott.—6583. Boca Grande, Mex. March, 1855. Dr. Kennerly, 38.

Found near streams and tanks to the Sierra Madre.—(D. N. Couch.)

Observed frequently at Boca Grande and elsewhere along the Corralitos river; generally three or more together. Often heard during the night flying over the camp uttering their peculiar and melancholy note.—(Kennerly.)

188. STREPSILAS INTERPRES, Ill. (p. 701.)—Turnstone.

4188. Brazos Santiago. 4187. Brownsville, Texas. Capt. Van Vliet.

189. RECURVIROSTRA AMERICANA, Gm. (p. 703.)—Avoset.

4174. Brazos. Capt. Van Vliet.

190. HIMANTOPUS NIGRICOLLIS, Vieill. (p. 704.)—Stilt.

4179. Brazos. Capt. Van Vliet.

191. GALLINAGO WILSONII, Bon. (p. 710.)—English Snipe.

4183 ♀. Brownsville, Texas. February, 1853. Lt. Couch.

Found by itself at the tank of Charco Escondido.—(D. N. Couch.)

192. MACRORHAMPHUS GRISEUS, Leach. (p. 712.)—Red-breasted Snipe.

6647 ♀. Espia, Mexico. March 27, 1853. Dr. Kennerly.

This bird was very rare; only observed occasionally in the valley of the Corralitos river and once in the valley of the Palatado. The two specimens procured were associated and no others seen in this vicinity.—(Kennerly.)

193. TRINGA CANUTUS, Linn. (p. 715.)—Gray Back.

4170. Brazos. Capt. Van Vliet.

194. TRINGA MACULATA, Vieill. (p. 720.)—Jack Snipe.

4186. Tamaulipas, Mexico. Lt. Couch.

72. Found at the tank of Charco Escondido.—(D. N. Couch.)

195. GAMBETTA MELANOLEUCA, Bon. (p. 731.)—Tell-Tale.

6625. Eagle Pass, Texas. A. Schott—6628. San Elizario, do.

196. GAMBETTA FLAVIPES, Bon. (p. 732.)—Yellow-Legs.

4179. Fort Brown, Texas. Lt. Couch.

197. NUMENIUS LONGIROSTRIS, Wilson, (p. 743.)—Long-billed Curlew.

Found in flocks in the open prairie near a ranch; natives said they came every day at the same place towards evening, for the purpose of feeding.—(D. N. Couch.)

198. RALLUS VIRGINIANUS, Linn. (p. 748.)—Virginia Rail.

6654. Santa Cruz, Sonora. June, 1855. Dr. Kennerly, 72.

Found in the grass and weeds in the immediate vicinity of the Santa Cruz river. They were extremely rare, the specimen procured being the only one seen.—(Kennerly.)

199. PORZANA CAROLINA, Vieill. (p. 749.)—Common Rail.

4555. Colorado river, Cal. A. Schott, 41.

200. FULICA AMERICANA, Gm. (p. 751.)—Coot.

6621. Espia, Mexico. March, 1855. Dr. Kennerly, 46.—4557. San Pasqual, Cal. A. Schott, 4.

Observed everywhere along the line wherever permanent water was found.—(Kennerly.)

201. GALLINULA GALEATA, Bon. (p. 752.)—Florida Gallinule.

9825. San Pedro. Dr. Kennerly.

202. ANSER GAMBELII, Hartlaub. (p. 761.)—White-fronted Goose.

10463. Frontera, Texas. J. H. Clark.—9967. Rio Grande. A. Schott.

203. BERNICLA CANADENSIS, Boie. (p. 764.)—Canada Goose.

9961. Frontera, Texas. J. H. Clark.

204. DENDROCYGNA AUTUMNALIS, Eyton. (p. 770.)—Long-legged Duck.

PLATE XXV.

9871 ♂. Isla los Ayuntas, (Rio Grande.) Sept. 8, 1853. A. Schott.—9872. Texas. do.

205. ANAS BOSCHAS, Linn. (p. 774.)—Mallard.

9693. Boca Grande, Mexico. March, 1855. Dr. Kennerly. 30.

Found abundantly along the Corralitos and Janos rivers; generally in flocks, but sometimes alone. Abundant also along the Rio San Pedro of Sonora.—(Kennerly.)

206. DAFILA ACUTA, Jenyns. (p. 776.)—Pintail.

9769 ♂. Texas. A. Schott.

207. NETTION CAROLINENSIS, Baird. (p. 777.)—Green-winged Teal.

9734 ♂. El Paso, Texas. J. H. Clark.—9728. Boca Grande, Mexico. March, 1855. Dr. Kennerly. 31.

Not very often observed; generally in flocks.—(Kennerly.)

208. QUERQUEDULA DISCORS, Steph. (p. 779.)—Blue-winged Teal.

4140 ♂. New Leon, Mexico. May, 1853. Lieut. Couch.—9751 ♀. Sabinitas, Rio Grande. Sept. 25, 1853. A. Schott.

209. In flocks, May '53. D. N. Couch.

210. QUERQUEDULA CYANOPTERA, Baird. (p. 780.)—Red-breasted Teal.

9739 ♂. El Paso, Texas. J. H. Clark.

211. SPATULA CLYPEATA, Boie. (p. 781.)—Shoveller.

4138 ♀. New Leon, Mexico. Lieut. Couch.

212. CHAULELASMUS STREPERUS, Gray. (p. 782.)—Gadwall.

9794 ♂. Janos, Mexico. April, 1855. Dr. Kennerly. 87.

This beautiful duck was very common in the vicinity of Janos in the month of April, going in large flocks. Beyond this point it was not observed.—(Kennerly.)

213. MARECA AMERICANA, Steph. (p. 783.)—Baldpate.

9713 ♂. El Paso, Texas. J. H. Clark.—9706. Boca Grande, Mexico. March, 1855. Dr. Kennerly. 28.

Found on Janos and Corralitos rivers at various points. At this season generally going in pairs, rarely in large flocks. Very shy.—(Kennerly.)

214. FULIX COLLARIS, Baird, (p. 792.)—Ring-necked Duck.

9870. Boca Grande, Mexico. March, 1855. Dr. Kennerly. 32 —Janos, Chihuahua. April, 1855. Do.

The first specimen was procured at Boca Grande, the only one there observed. It was quite tame and easily approached. The second specimen was procured on Janos river in April where it was found in very large flocks.—(Kennerly.)

215. AYTHYA AMERICANA, Bon. (p. 793.)—Red-head.

4621. Rio Grande. Feb. 7, 1855. A. Schott. 45.

216. BUCEPHALA ALBEOLA, Baird, (p. 797.)—Butter Ball.

4886. Colorado Laguna, N. M. A. Schott. 59.—9844 ♂. Boca Grande, Mexico. March, 1855. Dr. Kennerly. 29.

Found at this season in flocks at Boca Grande and other points on the Corralitos and Janos rivers.—(Kennerly.)

217. ERISMATURA RUBIDA, Bonap (p. 811.)—Ruddy Duck.

9848. Janos, Mexico. April, 1855. Dr. Kennerly. 65.—9847, 4607. San Pasqual, Cal. A. Schott.

Found in large flocks on a small lake near Janos, in April, and observed in pairs on the Palatado in the same month.—(Kennerly.)

218. MERGUS AMERICANUS, Cassin. (p. 813.)—Goosander.

9881. Boca Grande, Chihuahua. March, 1855. Dr. Kennerly. 33.

Frequently observed here and elsewhere along the Corralitos river in large flocks. Exceedingly fat and heavy, but not at all palatable, owing to the fact that they feed entirely upon fishes. The specimen when procured had within its throat several fishes, three or four inches in length.—(Kennerly.)

219. LARUS DELAWARENSIS, Ord. (p. 846.)—Ring-billed Gull.

4161. Brazos, Texas. Captain Van Vliet.

220. CHROICOCEPHALUS ATRICILLA, Linn. (p. 850.)—Laughing Gull.

Brazos, Texas. Captain Van Vliet.

221. STERNA ACUFLAVIDA, Cabot. (p. 860.)—Cabot's Tern.

Brazos, Texas. Captain Van Vliet.

222. RHYNCHOPS NIGRA, Linn. (p. 866.)—Skimmer.

Brazos, Texas. Captain Van Vliet.

223. PELECANUS ERYTHRORHYNCHUS, Gmelin. (p. 868.)—White Pelican.

9947. Rio Grande, Texas, 1853. A. Schott.

224. GRACULUS MEXICANUS, Bon. (p. 879.—Texas Cormorant.

3834. Brazos, Texas. Captain Van Vliet.

225. PODICEPS CLARKII, Lawrence. (p. 891.)—Clark's Grebe.

9930. Chihuahua Territory. J. H. Clark.

226. PODICEPS DOMINICUS, Lath. Mexican Grebe.

The existence of this bird in Texas, is shown by its eggs collected at Matamoras, by Dr. Berlandier.

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Turkey buzzard	3
Turnstone	25
Ultramarine jay	21
Violet-green swallow	11
Vireo atricapillus	12
belli	12
flaviviridis	12
huttoni	12
noveboracensis	12
olivaceus	12
Virginia rail	26
Western blnebird	9
lark	10
red-tail	3
White-bellied swallow	11
crowned sparrow	15
eyed vireo	12
fronted goose	26
ibis	24
necked crow	20
pelican	28
rumped shrike	11
throated wren	13
winged dove	21
Wood ibis	24
Woodhouse's jay	20
Xanthocephalus icterocephalus	18
Xanthoura luxuosa	21
Yellow-bellied woodpecker	5
crowned night heron	24
headed blackbird	18
legs	25
poll	10
throated warbler	10
winged sparrow	15
Zenaidura carolinensis	21
Zonotrichia gambelii	15
leucophrys	15

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SCOPS Mº CALLII.

1. TROGON MEXICANUS. [Male]–2. Under View of a Tail of different Specimen.

Lith. et col. Bowen & Co. Philada.

1. PICUS SCALARIS.—2. PICUS NUTTALLII.

Fig.1

Fig.2.

CENTURUS FLAVIVENTRIS._1.Male._2.Female.

1 & 2 SELASPHORUS PLATYCERCUS. – 1.Male 2.Female.
3 TROCHILUS ALEXANDRI. – Male.

PLATE

VI

IS

MISSING

CERYLE AMERICANA — 1 Adult. 2 Young

MOMOTUS COERULEICEPS.

1. PACHYRHAMPHUS AGLAIAE Male.
2. RATHMIDUROS MAJOR Female.
3. MYARCHUS LAWRENCII Female.

TYRANNUS VOCIFERANS.

1. TYRANNUS COUCHII — 2. TYRANNUS MELANCHOLICUS. Tail
3. EMPIDONAX OBSCURUS.

TOXOSTOMA LECONTEI

Lith et col. Bowen & Co. Philada.

TAXOSTOMA CURVIROSTRE

TOXOSTOMA LONGIROSTRIS.

1. LOPHOPHANES WOLLWEBERI. 2. AEGITHALUS FLAVICEPS. 3. PSALTRIPARUS MELANOTIS.

Fig 3.

Fig 1.

Fig 2.

1. CHRYSOMITRIS MEXICANUS. 2. SPERMOPHILA MORELETII (Male)
3. SPERMOPHILA MORELETII (Female)

1 SPIZELLA ATRIGULARIS
2 EMBERNAGRA RUFIVIRGATA

1. CYANOLOXIA PARELLINA. Male. — 2. SPIZA VERSICOLOR. Male.

Lith. et. col. Bowen & Co. Phila.

1. ICTERUS PARISORUM—2. ICTERUS WAGLERI

QUISCALUS MACROURUS

CYANOCITTA WOODHOUSEI

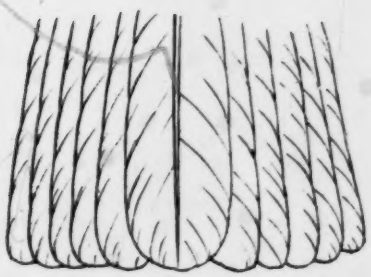
Lith et col Bowen & Co Philada.

Fig 1.

a.

Fig 2

b



1 CYANOCITTA SORDIDA—2 CYANOCITTA ULTRAMARINA, a Bill, b Tail.

COLUMBA FLAVIROSTRIS

Lith. et col. Bowen & Co. Philada.

ORTYX TEXANUS.

DENDROCYGNA AUTUMNALIS

UNITED STATES AND MEXICAN

BOUNDARY SURVEY,

UNDER THE ORDER OF

LIEUT. COL. W. H. EMORY,

MAJOR FIRST CAVALRY, AND UNITED STATES COMMISSIONER.

REPTILES

OF THE BOUNDARY,

BY

SPENCER F. BAIRD,

ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION.

WITH NOTES BY THE NATURALISTS OF THE SURVEY.

CHELONIA.[1]

1. ASPIDONECTES EMORYI, Agassiz.—Soft-shelled Turtle.

Aspidonectes Emoryi, Agassiz, Contributions to Nat. Hist. U. S., I, 1857, 407.

Lower Rio Grande of Texas. J. H. Clark.

2. GYPOCHELYS LACERTINA, Agassiz.—Alligator Turtle.

Gypochelys lacertina, Agass. Cont. I, 1857, 414.
Chelydra lacertina, Schweigger, Prodromus.
Chelonura temminckii, Holbrook.

Lowlands of Texas.

3. OZOTHECA TRISTYCHA, Agassiz.

Ozotheca tristycha, Agassiz, Cont. I, 1857, 425.

Medina river, Texas. Dr. Kennerly.

4. THYROSTERNUM SONORIENSE, Agassiz.

Kinosternon sonoriense, Leconte, Pr. A. N. Sc. VII. 1853, 184.
Thyrosternum sonoriense, Agassiz, Contributions, I, 1857, 428; pl. v, figs. 8–11.

Tucson and Guadalupe cañon. Dr. Kennerly.

5. PLATYTHYRA FLAVESCENS, Agassiz.

Platythyra flavescens, Agassiz, Contributions, I, 1857, 430; pl. v, fig. 12–15.

Texas, and valley of Gilla.

6. PTYCHEMYS MOBILENSIS, Agassiz.

Emys mobilensis, Holbrook, N. Am. Herp. I, 1842, 71; pl. ix.
Ptychemys mobilensis, Agassiz, Contributions, I, 1857, 433; pl. iii, figs. 14—16

Guadalupe mountains and Pecos river, Texas.

7. TRACHEMYS ELEGANS, Agassiz.

Emys elegans, Maxim. Reise Nord. Am. I, 1839, 213.
Trachemys elegans, Agassiz, Cont. I, 1857, 435.

Brownsville, Texas.

[1] Note.—The descriptions of genera and species in the present article have been either omitted entirely, or in most cases greatly curtailed, owing to the fact that the report, as prepared, greatly exceeded the limits of space assigned.
A number of the species have been determined, or their characters better defined, by Dr. Girard and Mr. Kennicott. The contributions of those gentlemen have their name attached.—(S. F. Baird.)

8. CHRYSEMYS OREGONENSIS, Agassiz.

Emys oregonensis, HARLAN, Amer. Jour. Sc. XXXI, 382.
Chrysemys oregonensis, AGASSIZ, Cont. I, 1857, 440.

Guadalupe mountains, Texas.

9. XEROBATES BERLANDIERI, Agassiz.—Texas Gopher.

Xerobates berlandieri, AGASSIZ, Cont. I, 1867, 447.

Lower Rio Grande.

SAURIA.

10. ALLIGATOR LUCIUS, Cuv.

3184. Brownsville, Texas. Capt. Van Vliet.

11. SCELOPORUS CLARKII, B. & G.

Sceloporus clarkii, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 127.
Sceloporus magister, Hallow. Pr. A. N. Sc. VII, 1854, 93.

2940. Sonora. J. H. Clark.—2897. Alamo de Parras, Mex. Lt. Couch.—2964. Janos. Dr. Kennerly.—2965. Sta. Madelina. A. Schott.—2954. Los Nogales, Sonora. Dr. Kennerly.

12. SCELOPORUS SPINOSUS, Wieg.

Plate XXIX, Figs. 4—6.

Sceloporus spinosus, Wiegmann, Isis, 1828, 369—Ib. Herp. Mex. 1834, 50; pl. vii.

2968. El Paso? J. H. Clark.—2943. Indianola, Tex. J. H. Clark.—2945. Laredo to Camargo. A. Schott.

13. SCELOPORUS CONSOBRINUS, B. & G.

Sceloporus consobrinus, B. & G. Marcy's Report, 1853, 237.

4109. R. San Pedro, Tex. J. H. Clark.—2899. Janos to San Luis Springs. Dr. Kennerly.

14. SCELOPORUS TORQUATUS, Wiegm.

Agama torquata, Peale & Green, Pr. A. N. Sc. II, 131.
Sceloporus torquatus, Wiegmann, Isis, 1828, 369.

2959. Laredo to Camargo. A. Schott.

15. SCELOPORUS POINSETTII, B. & G.

Plate XXIX, Figs. 1—3.

Sceloporus poinsettii, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 126.

2952. Sonora. J. H. Clark.—2955. Limpia mountains, Tex. Dr. Kennerly.—2948. San Pedro. J. H. Clark.

16. SCELOPORUS ORNATUS, Baird.

Sceloporus ornatus, Baird, Pr. A. N. Sc. Dec. 1858.

Sp. Ch.—Dorsal scales in about 64 oblique series, with but slight carination, mucronation, and denticulation. Femoral pores, 12. A well marked black cervical collar, complete above, and margined with

yellowish. Color dark green above, nearly black towards the median line. Back with small yellowish spots.

2845. Patos, Coahuila. Lt. Couch.

17. SCELOPORUS THAYERI, B. & G.

Sceloporus thayeri, B. & G., Pr. A. N. Sc. VI, Aug. 1852, 127.

2896. San Pedro, Texas, J. H. Clark.—2887. Indianola. J. H. Clark.

18. SCELOPORUS SCALARIS, Wiegmann.

Sceloporus scalaris, Wiegm. Herp. Mex. 1834, 52: tab. viii, f. 2.

2284. Los Nogales, Sonora. Dr. Kennerly.

19. SCELOPORUS MARMORATUS, Hallow.

Sceloporus marmoratus, Hallow. Pr. A. N. Sc. VI, Oct. 1852, 178.
Sceloporus delicatissimus, Hallow. Pr. A. N. Sc. VI, Oct. 1852, 178.

2916. Medina, Texas. J. H. Clark.—4116. Redmond's Ranch, Texas. J. H. Clark.

20. SCELOPORUS COUCHII, Baird.

Sceloporus couchii, Baird, Pr. A. N. Sc. Dec. 1858.

Sp. Ch.—General appearance of *S. marmoratus*, Hall. Cephalic plates smooth. Scales very small. About 80 oblique dorsal rows from head to tail. Femoral pores, 25. Color above dark green, with two lateral light stripes, separated by 18 rows of scales. Back with irregular spots. Sides with a white band from groin. An obsolete dark indigo patch on each side the belly, widely separated below. Sides of jaw banded transversely with blue and whitish. A sub-circular indigo patch in front of shoulder, surrounded by light blotches.

2904. Pesquieria Grande, Mexico. Lt. Couch.—2739. Santa Caterina, New Leon. Lt. Couch.

21. EUPHRYNE OBESA, Baird.

Plate XXVII.

Euphryne obesus, Baird, Pr. A. N. Sc. Dec. 1858.

Sp. Ch.—Width of head nearly equal to distance from nose to ear. Tail shorter than the body. General color of the young, olive green, with five broad transverse bars above from head to base of tail, and about as many on the tail; these rings yellow, dotted with red. Beneath, pea green, dotted with black. With increasing age the bands become obsolete and disappear, the general color becoming reddish olive.

2774 Fort Yuma. Major Thomas.—4172. Do. A. Schott.

22. CROTAPHYTUS COLLARIS, Holbrook.

Agama collaris, Say, Long's Exped. II, 1823, 252.
Crotaphytus collaris, Holb. N. Am. Herp. II, 1842, 72: pl. x.

2694. Sonora. Dr. Kennerly.—2710. San Antonio to El Paso. J. H. Clark.

23. CROTAPHYTUS RETICULATUS, Baird.

Crotaphytus reticulatus, Baird, Pr. A. N. Sc. Dec. 1858.

Sp. Ch.—Infra-orbital chain in a series of six or eight nearly equal plates. Scales on the gular fold much smaller than those between the fore legs. Above ashy gray, with a hexagonal reticulation of

lighter; the interstices here and there dark brown. Chin and throat reticulated. Neither black collar nor light spots. More closely related to *Crotaphytus collaris* than to *Crotaphytus* (*Gambelia*) *wislizenii*.

2692. Ringgold Barracks, Texas. J. H. Clark.—2731. Laredo, Texas. A. Schott.

24. CROTAPHYTUS WISLIZENII, B. & G.

PLATE XXXI.

Crotaphytus wislizenii, B. & G. Pr. A. N. Sc. VI, April, 1852, 69.
Crotaphytus gambelii, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 126.
Crotaphytus fasciatus, HALLOWELL, Pr. A. N. Sc. VI, Dec. 1852, 207.

2704. San Antonio to El Paso. J. H. Clark.—2685. Sonora. J. H. Clark.

25. UTA STANSBURIANA, B. & G.

Uta stansburiana, B. &. G. Pr. A. N. Sc. VI, April, 1852, 69.

2745. San Antonio to El Paso. J. H. Clark.—2740. Gila desert. A. Schott.

26. UTA ORNATA, B. & G.

Uta ornata, B. & G., Pr. A. N. Sc. VII, Aug. 1852, 126.

2700. San Pedro, Texas. J. H. Clark.—2764. Eagle Pass, Texas. A. Schott.—2737. Sonora. J. H. Clark.

27. UTA ORNATA VAR. LINEARIS, Baird.

Similar in markings to the described character of *U. ornata*, but with four linear interrupted black stripes instead of transverse bands.

2759. Los Nogales, Sonora. Dr. Kennerly.

28. UTA SYMMETRICA, Baird.

Uta symmetrica, BAIRD, Pr. A. N. Sc. Dec. 1858.

SP. CH.—Larger dorsal scales in four regular series, two on either side of the median smaller ones. Head short, depressed, one and a half times as wide as deep. Tail one and a half times the head and body. General color light brown above, the belly white. Sides with broad transverse bands of blackish. Size of *U. ornata*.

2760. Gila river. A. Schott.

29. UTA SCHOTTII, Baird.

Uta schottii, BAIRD, Pr. A. N. Sc. Dec. 1858.

SP. CH.—Dorsal scales and size as in the last. Head pointed, narrow, nearly or quite as high as wide. General color nearly black, scarcely lighter beneath. Back with small blue spots. Tail banded laterally with the same.

3761. Santa Madelina. A. Schott.

30. UTA GRACIOSA, Baird.

Urosaurus gracioeus, HALLOWELL, Pr. A. N. Sc. VII, June, 1854, 92.

4128. Colorado river, California. A. Schott.

31. DIPSOSAURUS DORSALIS, Hallowell.

PLATE XXXII, FIGS. 7—13.

Crotaphytus dorsalis, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 126.
Dipsosaurus dorsalis, HALL, Pr. A. N. S. VII, June, 1854, 92.

4178. Colorado desert. A. Schott.

32. CALLISAURUS VENTRALIS, Baird.

Homalosaurus ventralis, HALLOWELL, Pr. A. N. Sc. VI, October, 1852, 179.

2981. Colorado desert. A. Schott.

33. HOLBROOKIA MACULATA, Girard.

Holbrookia maculata, GIRARD, Pr. Am. Assoc. for 1850–1851, 201

2807. San Antonio to El Paso. J. H. Clark.

34. HOLBROOKIA PROPINQUA, B. & G.

Holbrookia propinqua, B. & G., Pr. A. N. Sc. VI, Aug. 1852, 126.

2671. Indianola to San Antonio. J. H. Clark.

35. HOLBROOKIA APPROXIMANS, Baird.

Holbrookia approximans, BAIRD, Pr. A. N. Sc. Dec. 1858.

SP. CH.—Similar in size and general character to *H. maculata*. Tail shorter than body. Two small vertical indigo black patches on the side of the belly, entirely visible from below, with a light blue areola. Central point of belly about opposite the middle point between the two patches. No light stripe on side of neck. Upper parts and sides gray, sprinkled with whitish. Head broad, very convex above. Hind foot about one-third the head and body.

Tamaulipas. Lt. Couch.

36. HOLBROOKIA TEXANA, B. & G.

PLATE XXX.

Cophosaurus texanus, TROSCHEL, Wiegmann's Archiv für 1850, 1852, 389.
Holbrookia texana, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 125.

2659. San Pedro, Texas. J. H. Clark.—2782. Colorado desert, California. A. Schott.

37. HOLBROOKIA AFFINIS, B. & G.

Holbrookia affinis, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 125.

2667. Sonora. J. H. Clark.

38. TAPAYA HERNANDEZII, Girard.

Tapaya hernandezii, GIRARD, Herp. U. S. Ex. Ex. 1858, 395.

SP. CH.—Head large, depressed; vertex broad, slightly inclined anteriorly, snout protruding. Cephalic plates small; occipital and temporal spines small and conical. External ears simple, granular. Mental scales very small; the series adjoining the sub-maxillar shields larger than the rest. Several folds under

the throat minutely granular. Abdominal scales small, sub-rhomboid, acuminated. Terminal pores small, not continuous across the interfemoral region. Color blackish brown above, with a double or quadruple series of black, light margined spots. Beneath yellowish, unicolor, or else obscurely maculated.—(GIRARD.)

No. 195. Between Guadalupe mountains. Pecos. A. Schott.—Chihuahua. J. H. Clark.

39. TAPAYA ORNATISSIMA, Girard.

Phrynosoma orbiculare, HALL. Sitgreaves' Exped. 1853, 125; pl. viii, ix.
Tapaya ornatissima, GIRARD, Herp. U. S. Ex. Ex. 1858, 396.

No. 205. Pecos to Rio Grande, Texas. Dr. Kennerly.—No. 206. Janos to San Luis Springs. Dr. Kennerly.

40. PHRYNOSOMA CORNUTUM, Gray.

Agama cornuta, HARL. J. A. N. Sc. IV, II, 1825, 299.
Phrynosoma cornutum, GRAY, Syn. Rept. Griff. Cuv. IX, 1831, 45.

No. 121. Indianola, and 122, San Antonio. J. H. Clark.—No. 126. Eagle Pass, Texas. A. Schott.—No. 124. Los Nogales. Dr. Kennerly.

41. PHRYNOSOMA REGALE, Girard.

PLATE XXVIII, FIGS. 1—3.

Phrynosoma regale, GIRARD, Herp. U. S. Ex. Ex. 1858, 406.

SP. CH.—Vertex and occipital regions quite depressed. Temporal and occipital spines flat and acute, constituting a continuous series, very much inclined backwards. Labial plates proportionally well developed, unequal, and rugose. Scales under the chin small, rounded, sub-convex; largest series sub-pyramidal and acuminated. Pectoral scales moderate, and acuminated also. Lower series of sub-pyramidal scales at the periphery of the abdomen obsoletely developed. Abdominal scales sub-rhombic, not acuminated, and slightly, though distinctly, keeled. Femoral pores small and closely set together; the series from either side not continuous on the interfemoral region, over which they somewhat extend. Post-anal scales very minute. Ground color brownish olive above, back, limbs, and tail transversely maculated with black; beneath yellowish, with small black spots over the middle of the abdomen.—(GIRARD.)

From the valleys of the Gila and Colorado rivers.

No. 161. Gila and Colorado desert. A. Schott.

42. DOLIOSAURUS Mc'CALLI, Girard.

PLATE XXVIII, FIGS. 4—6.

Anota mc'callii, HALLOW. Pr. A. N. Sc. VI, 1852, 182.
Doliosaurus mc'callii, GIRARD, Herp. U. S. Ex. Ex. 1858, 400.

SP. CH.—Cephalic plates moderate. Occipital spines rather elongated and slender. Sub-maxillar shields very large; posterior ones spinous. No external auricular aperture. Scales under the chin very small, sub-equal, with two distant longitudinal series of somewhat larger ones. Pectoral scales large, carinated, and acuminated. A triple series of sub-pyramidal scales at the periphery of the abdomen; middle one alone well developed. Abdominal scales small, slightly carinated. Femoral pores extending somewhat over the interfemoral region, though the series from either side are not continuous. Yellowish olive above, with a dorsal black line, and a double series of rounded spots on either side of the back, uniting into one along the tail; whitish yellow beneath, unicolor.—(GIRARD.)

No. 162. Gila and Colorado deserts. A. Schott.

43. DOLIOSAURUS MODESTUS, Girard.

Phrynosoma modestum, Girard, Stansbury's Expl. Great Salt Lake, 1852, 361, 365; pl. vi, figs. 4—8.

Dolicosaurus modestus, Girard, Herp. U. S. Ex. Ex. 1858, 409.

No. 164. San Antonio to El Paso.—No. 166. Sonora. J. H. Clark.—No. 168. Los Nogales.—No. 170. Janos. Dr. Kennerly.

44. CNEMIDOPHORUS GRAHAMII, B. & G.

Plate XXXII, Figs. 1—6.

Cnemidophorus grahamii, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 128.

3045. San Antonio to El Paso. J. H. Clark.—3044. Los Nogales. Dr. Kennerly.

45. CNEMIDOPHORUS INORNATUS, Baird.

Cnemidophorus inornatus, Baird, Pr. A. N. Sc. Dec. 1858.

Sp. Ch.—Scales on the gular fold smaller than those on the breast anteriorly, and scarcely larger than those on the middle of the chin. Scales of back tubercular and elevated. Hind feet about two-fifths the head and body. General color light greenish olive, paler beneath. No lines on the body.

3032. Pesquieria Grande. New Leon. Lieutenant Couch.

46. CNEMIDOPHORUS OCTOLINEATUS, Baird.

Cnemidophorus octolineatus, Baird, Pr. A. N. Sc. Dec. 1858.

Sp. Ch.—Gular fold as in the last. Hind foot not two-fifths the head and body. Scales of back depressed. General color light greenish olive, paler beneath. Back with eight equi-distant and approximated light lines.

3009. Pesquieria Grande. New Leon. Lieutenant Couch.

47. CNEMIDOPHORUS PERPLEXUS, B. & G.

Cnemidophorus perplexus, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 128.

3020. San Pedro, Texas. J. H. Clark.—3008. Tucson. Dr. Kennerly.

48. CNEMIDOPHORUS TIGRIS, B. & G.

Plate XXXIII.

Cnemidophorus tigris, B. & G. Pr. A. N. Sc. VI, Ap. 1852, 69.
? *Cnemidophorus marmoratus*, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 128.
Cnemidophorus undulatus, Hallow. Pr. A. N. Sc. VII, June, 1854, 94.

3024. San Antonio to El Paso. J. H. Clark.—3036. Laredo. A. Schott.

49. CNEMIDOPHORUS GRACILIS, B. & G.

Plate XXXIV, Figs. 7—14.

Cnemidophorus gracilis, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 128.

3019. Castanuelas, Coahuila. Lieutenant Couch.

CNEMIDOPHORUS GULARIS, B. & G.

PLATE XXXIV, FIGS. 1—6.

Cnemidophorus gularis, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 128.
Cnemidophorus guttatus, HALLOW. Pr. A. N. Sc. VII, Oct. 1854, 192.

3010. Eagle Pass, Tex. A. Schott.—2989. Indianola, Tex. J. H. Clark.

50. HELODERMA HORRIDUM, Wiegm.

PLATE XXVI.

Heloderma horridum, WIEGMANN, Isis, 1829, 627.—IB. Herp. Mex. 1834.

2971. Sierra de la Union. Sonora. A. Schott.

51. GERRHONOTUS WEBBII, Baird.

PLATE XXIV, FIGS. 1—10. Young.

Gerrhonotus webbii, BAIRD, Pr. A. N. Sc. Dec. 1858.

SP. CH.—Tail 2½ times the head and body. Scales strongly carinated. Dorsal scales in 48 transverse rows. Body encircled by 26 rows of scales, of which 12 are ventral. Hind feet longer than from snout to ear. Above leaden olivaceous brown, lighter beneath. Back with ten or twelve blackish bars, bordered in front by brownish or reddish yellow.

3205. San Diego.—3078. San Diego to El Paso. Dr. Webb.

52. GERRHONOTUS NOBILIS, Bg.

PLATE XXV, FIGS. 1—8.

Elgaria nobilis, B. & G., Pr. A. N. Sc. VI, Aug. 1852, 129.

3076. Coppermines of N. M. J. H. Clark.

53. GERRHONOTUS INFERNALIS, Baird.

Gerrhonotus infernalis, BAIRD, Pr. A. N. Sc. Dec. 1858.

SP. CH.—Dorsal scales carinated, in 16 longitudinal rows; ventral in 12. Nasal plate in contact with the 2d labial only. Tail twice as long as head and body. 51 transverse rows of scales from head to tail. Color clear light olive, with 8 cross bars of dusky. Beneath yellowish, marbled faintly with dull olive. Head plain.

3090. Devil's river, Tex. Dr. Kennerly.

54. GERRHONOTUS OLIVACEUS, Baird.

Gerrhonotus olivaceus, BAIRD, Pr. A. N. Sc. Dec. 1858.

SP. CH.—No single frontal. A series of three pairs of plates between the vertical and rostral, becoming successively smaller. Two post-nasals; one loral. 39 transverse rows of scales on back from head to tail. 12 longitudinal rows above; the 6 central strongly carinated. Color dark olive green, with a series of faint dusky bars. Beneath greenish white.

3096. Near San Diego, Cal. A. Schott.

55. PLESTIODON GUTTULATUS, Hallow.

Lamprosaurus guttulatus, Hallowell, Pr. A. N. Sc. VI, Dec. 1852, 206.
Plestiodon guttulatus, Hallowell, Pr. A. N. Sc. VII, Dec. 1857, 215.

3167. San Elziario, Tex. Dr. Kennerly.

56. ANOLIS CAROLINENSIS, Cuv.

2988. Victoria, Tex. Dr. Kennerly.

57. PHYLLODACTYLUS TUBERCULOSUS, Wiegm.

Plate XXIII, Figs. 1—8.

Phyllodactylus tuberculosus, Wiegm. Nova Acta, K. L. C. Acad. XVII, i, 241.

No. 3208. Durango, Mex. Dr. T. H. Webb.

57. SPHAERIODACTYLUS NOTATUS, Baird.

Plate XXIV, Figs. 29—37.

Sphaeriodactylus notatus, Baird, Pr. A. N. Sc. Ph. Dec. 1858.

Sp. Ch.—Scales on back and sides large, equal, strongly carinated; those on belly smaller, smooth, hexagonal. Above light brownish yellow, uniformly dotted above with reddish brown, most distinct on the head, least so on the belly.

Hab.—Key West, Fla., Professor Agassiz and Prof. W. H. B. Thomas. Type No. 3215.

This species, though not an inhabitant of the regions traversed by the Boundary Commission, is introduced for the purpose of illustrating, by its figures, more fully the characters of *Stenodactylus* and *Phyllodactylus*.

58. STENODACTYLUS VARIEGATUS, Baird.

Plate XXIII, Figs. 9—27.—Plate XXIV, Figs. 11—19.

Stenodactylus variegatus, Baird, Pr. A. N. Sc. Dec. 1858.

Sp. Ch.—Head very broad. Hind foot contained six times in head and body. Above brownish yellow, ith irregular small blotches of light reddish brown, sometimes in broad transverse bands. Edges of eyelids and whole under surface opaque white.

3217. Colorado desert. A. Schott.—3211. Live Oak Creek, Tex. Dr. Kennerly.

59. PLESTIODON OBSOLETUS, B. & G.

Plate XXV, Figs. 9—16.

Plestiodon obsoletum, B. & G. Pr. A. N. Sc. VI, Aug. 1852, 129.

3133. Western Texas. J. H. Clark.—3117. El Paso. J. H. Clark.

60. PLESTIODON TETRAGRAMMUS, Baird.

Plestiodon tetragrammus, Baird, Pr. A. N. Sc. Dec. 1858.

Sp. Ch.—One post-nasal plate; post-frontal and inter-nasals separated by the post-nasal. Five supra-orbitals. Dorsal scales of equal width. Light olive green above; sides with two yellowish lines, sepa-

rated by six rows of darker olive scales. Upper labials pure yellowish. Body encircled by about 28 rows of scales. No dorsal stripe.

3139. Salado river. Dr. Kennerly.—3124. Matamoras, Mex. Lt. Couch.

61. LYGOSOMA LATERALE, Dum. Bib.

Scincus lateralis, Say. Long's Exp. II, 1823, 324.
Lygosoma lateralis, Dum. Bib. Erp. Gen. VI, 1839, 719.

3126. Indianola, Tex.—3146. San Pedro, Tex. J. H. Clark.

62. ANNIELLA PULCHRA, Gray.

Anniella pulchra, Gray, Annals & Mag. Nat. Hist. X, 1852, 440.

3190. Coast mountains, near San Diego. A Schott.

OPHIDIA.

63. CROTALUS ATROX, B. & G.

PLATE I.

Crotalus atrox, B. & G. Catal. N. A. Serpents, Jan. 1853, 5.

Nos. 258, 256, 4226, 271. Throughout Texas. Schott, Clarke, Kennerly.
Nos. 466, 467, 468. Bottoms of Gila and Colorado. A. Schott.

64. CROTALUS CONFLUENTUS, Say.

Crotalus confluentus, SAY. Long's Exped. II, 1823, 48.—B. & G. Catal. N. A. Serpents, Jan. 1853, 8.

No. 4228. Between San Antonio and El Paso. J. H. Clark.—No. 4247. Cimeron. J. H. Clark.

65. CROTALUS MOLOSSUS, B. & G.

PLATE II.

Crotalus molossus, B. & G. Catal. N. Am. Serp. Jan. 1853, 10.
Crotalus ornatus, HALLOW. Pr. A. N. Sc. VII, Oct. 1854, 192.

No. 485. Fort Webster. Copper Mines, N. M. J. H. Clark.

66. CROTALUS TIGRIS, Kennicott.

PLATE IV.

SP. CH.—Body slender; head small, very much depressed, narrow behind; nose remarkably broad and obtuse; whole outline of head nearly quadrangular. Superciliaries and frontals smooth; space between superciliaries very wide; four frontal plates, six post-frontals. Two rows of scales between sub-orbital chain (which is complete) and the labials. Labials 14 above, 13–14 below. Dorsal rows 21–23; very slightly carinated. Dorsal scales broad, rounded behind. Color yellowish ash above, with rather small indistinct dorsal brown blotches anteriorly; two posterior thirds of body banded with brown.—(KENNICOTT.)

Deserts of Gila and Colorado.
No. 471. Sierra Verde and Pozo Verde. A. Schott.

67. CROTALUS CERASTES, Hallowell.

PLATE III.

Crotalus cerastes, HALLOWELL, Pr. A. N. Sc., June, 1854, 95.

SP. CH.—Head small, angles rounded; nose obtuse, much depressed; rostral as broad as high; nostril in the middle of a single large plate. Lateral edge of superciliary plate elongated into a horn-like process directed upward over the eye. Two rows of scales between the sub-orbital series (which is

complete of large scales,) and the labials. Upper labials 11–13, lower 12–13. Dorsal rows of scales 21, slightly carinated; each scale along the middle of the back with a tubercular swelling toward the centre. Crown tubercular. Entire head and upper parts of a light yellowish, with a dorsal series of small indistinct blotches, below which are several irregular rows of isolated brown dots. A narrow brown stripe extends from the orbit back over the angle of the mouth.—(KENNICOTT.)

No. 482. Colorado river, California. A. Schott. Deserts of Gila and Colorado.

68. CROTALOPHORUS CONSORS, B. & G.

Crotalophorus consors, B. & G. Catal. N. A. Serp., Jan. 1853, 12.

SP. CH.—Twenty-five rows of dorsal scales all carinated, except the two first on either side. Color olivaceous brown, with seven series of deeper blotches, one dorsal, and three on each side; the dorsal series rather small and transverse. Yellowish white line from nostril passes between the eye and pit, and along the upper labials to the angle of the mouth.—(KENNICOTT.)

No. 512. Indianola, Texas. J. H. Clark.

69. CROTALOPHORUS EDWARDSII, B. & G.

PLATE V, FIG. 1.

Crotalophorus edwardsii, B. & G. Catal. N. Am. Serp., Jan. 1853, 15.

SP. CH.—Twenty-three rows of dorsal scales, two first rows smooth. Vertical plate sub-pentagonal, tapering to an acute point posteriorly. Color light yellowish brown, with chestnut blotches lighter than *C. tergeminus* or *C. consors*. Lateral blotches proportionally small. Yellowish line from nostril to angle of mouth as in *C. consors*. No vertebral reddish line.—

No. 506. Sonora. J. H. Clark.—511. Brownsville, Texas. J. H. Clark.

70. TOXICOPHIS PUGNAX, B. & G.—Moccasin.

PLATE VI.

Toxicophis pugnax, B. & G. Catal. N. Am. Serpents, Jan. 1853, 20.

SP. CH.—No loral plate. Second labial pressed out of place and with its apex alone on the edge of the mouth. Twenty-five dorsal rows. Above light olive-brown with transverse dark zigzag bands. Cheeks uniform light colored.—(KENNICOTT.)

4262. Indianola, Texas. J. H. Clark.—4263. Eagle Pass, Texas. A. Schott.

71. ANCISTRODON CONTORTRIX, B. & G.—Copperhead.

Boa contortrix, LINN. Syst. Nat. I, 1766, 273.
Agkistrodon contortrix, B. & G. Catal. Serp. 1823, 17.

567. Indianola to San Antonio. J. H. Clark.—571. Sabinal, Texas. J. H. Clark.

72. ELAPS TENER, B. & G.—Coral Snake.

PLATE VII, FIG. 1.

Elaps tener, B. & G. Catal. N. Am. Serp. Jan. 1853, 22.

SP. CH.—Head narrow and elongated for the genus, continuous with the neck and body. Body fawn-colored (in alcohol) annulated with black and yellow. The yellow annulations separating the black and

fawn color are each 2 to 2½ scales wide. Vertical and occipital plates narrow and elongated. Rostral wide and high; prefrontals sub-quadrangular.—(KENNICOTT.)

1119. San Pedro, Texas. J. H. Clark.—1127. Eagle Pass, Texas. A. Schott.—1132. Indianola, Dr. Kennerly.

73. DIPSAS SEPTENTRIONALIS, Kennicott.

PLATE VIII, FIG. 1.

SP. CH.—Body moderately slender, very much tapering anteriorly and posteriorly. Tail slender, about one-fifth the total length. Head ovoid, somewhat depressed, very large; twice as wide posteriorly as the neck. Crown flattened, concave behind the eyes; temporal regions much swollen. Snout obtusely pointed, scarcely more depressed than the vertical region. Vertical plate pentagonal elongated; broader in front, concave on the sides. Occipitals triangular, nearly as broad as long. Superciliaries small. Rostral broader than high. Nasals much larger than pre-frontals; two-thirds as high as long; emarginate above to receive the exterior edge of pre-frontals. Loral smaller than upper pre-orbital; as high as wide. Three pre-orbitals; the upper more than three times as large as either of the two lower, its inner angle produced to the vertical, separating the superciliary and post-frontal. Two post-orbitals; upper largest. Eight upper labials; sixth and seventh four times as large as either of the three anterior ones. Ten lower labials; fifth and sixth largest. Dorsal scales in 21 to 23 rows, narrow, acute posteriorly; first lateral row much widest. Body above, with broad, lustrous, brownish black half rings on a light yellowish ground. The black rings six to eight scales wide in the middle, narrowing very much, or even rounded off, laterally, sometimes not extending quite to the abdomen. Light intervals, one or two scales wide, on the vertebral region, widening to three or four times as much near the abdomen. Abdomen and lower surface of head uniform light yellowish. An irregular light occipital ring. Upper labials and anterior part of head brownish—lighter than the dark dorsal bands.—(KENNICOTT.)

The specimen figured has the anterior sub-caudal scutellae entire, but this is a monstrosity, the sub-caudal scutellae being normally all divided in this genus.

No. 4267. Matamoras, Tam. Lieut. Couch.—No. 2288. Brownsville, Tex. Van Vliet.

74. EUTAENIA PROXIMA, B. & G.

Coluber proximus, SAY, Long's Exped. I, 1823, 187.
Eutainia proxima, B. & G. Catal. N. Am. Serp. Jan. 1853, 25.

SP. CH.—Body stouter than *E. saurita* or *E. faireyi*. Brown or blackish above. Three longitudinal stripes; the dorsal ochraceous yellow or brown, the lateral greenish white or yellow on the third and fourth rows of scales. Dorsal stripe covering one and over two half rows of scales. Lateral row of scales usually the color of the abdomen. Total length about three and one half times that of the tail. Dorsal rows 19.—(KENNICOTT.)

Texas.

75. EUTAENIA ORNATA, B. & G.

PLATE IX.

Eutainia parietalis, B. & G. Catal. N. Am. Serp. Jan. 1853, 28. (Not *Coluber parietalis*, Say.)

745. Indianola, Tex. J. H. Clark.—438. Lower Rio Grande, Tex. J. H. Clark.—768. Near San Antonio. Dr. Kennerly.

76. EUTAENIA MARCIANA, B. & G.

Eutainia marciana, B. & G. Catal. N. Am. Serpents, Jan. 1853, 36.

Sp. Ch.—Head triangular, short, but very broad posteriorly. Nose pointed; upper labials 8; 6th largest; 7th nearly as large. Body rather stout, sub-cylindrical; tail short. Prominent color light brown; a vertebral paler line and one lateral on each side on the second and third lateral rows more or less indistinct. Three series of square black spots on each side, of about 56–60 in each series, from occiput to anus. Sides of head black, with a crescentic patch of yellowish posterior to the labial plates. Three and sometimes four black vittæ radiating from the eye across the jaws. A double white spot with a black margin on the suture of occipital plates.

1417. Indianola. J. H. Clark.—1418. Eagle Pass, Tex. A. Schott.—1419. San Pedro, Rio Grande, Tex. J. H. Clark.

77. NERODIA WOODHOUSII, B. & G.

Nerodia woodhousii, B. & G. Catal. N. Am. Serp. Jan. 1853, 42.

Sp. Ch.—Form of *Nerodia erythrogaster*, but the head broader behind and more flattened above. 25 dorsal rows, all carinated. Three rather large post-orbitals; ante-orbitals narrow; loral large. Three series of quadrangular dark blotches on a brownish clay colored ground. The middle series separated by narrow white lines; the lateral by intervals of the ground color wider than themselves; the three series perfect to the head. A double yellow occipital spot. A yellow spot between the superciliary and vertical plate. A black line indistinctly seen from the posterior point of the eye to the angle of the mouth. Abdomen unspotted.—(Kennicott.)

1308. Indianola, Tex. J. H. Clark.

78. REGINA GRAHAMII, B. & G.

Plate VII, Fig. 2. Young.

Regina grahamii, B. & G. Catal. N. Am. Serpents, Jan. 1853, 47.

Sp. Ch.—Dull dark brown, with a dorsal light brown line, margined on each side by a narrow indistinct black line. A broad yellowish stripe on the first, second, and third rows, margined above with an indistinct black line on the fourth and fifth rows, and below by a distinct narrow black line on the lower fourth of the first lateral row and the extreme ends of the abdominal scutellæ. Abdomen yellowish, tinged posteriorly in the old by olive, with a single central row of small sub-triangular black spots posteriorly, which disappear on the anterior third of the body, and are sometimes indistinct in young specimens. Dorsal rows of scales 19.—(Kennicott.)

1376. Rio Salado, Tex. J. H. Clark.

79. REGINA CLARKII, B. & G.

Plate X. Adult.—Plate XI, Fig. 2. Young.

Regina clarkii, B. & G. Catal. N. Am. Serp. Jan. 1853, 48.

Sp. Ch.—Yellowish brown above, with four longitudinal bands of deeper brown. Abdomen dull yellow, with two clouded brown bands dotted with black. One ante-orbital. Dorsal rows of scales 19, all carinated.

1392. Indianola. J. H. Clark.—1377. Indianola. Dr. Kennerly.

80. HETERODON COGNATUS, B. & G.

Heterodon cognatus, B. & G. Catal. N. Am. Serp. Jan. 1853, 54.

Sp. Ch.—Body shorter and stouter than in *H. platyrhinos*, head strikingly larger. Vertical plate longer than occipitals. Dorsal rows of scales 23–25; outer smooth; next scarcely carinated. Scales of the

rest with keels extending to their tips. Scales broader than in preceding. Disproportion between scales of the back, before and behind, not conspicuous. Light chestnut, with 20 yellow blotches from head to anus, and 9 on the tail. Beneath yellow.

1271. Indianola. J. H. Clark.

81. HETERODON NASICUS, B. & G.

Plate XI, Fig. 1.

Heterodon nasicus, B. & G. Stansbury's Rep. Great Salt Lake, 1852, 352.—Ib. Catal. Serp. 1853, 61.

Sp. Ch.—Vertical broader than long. Rostral excessively broad and high. Azygos plate surrounded behind and on the sides by many small plates (12–15.) Sometimes a second loral. Labials short and excessively high. Dorsal rows of scales 23, exterior alone smooth. A dorsal series of about 50 blotches, with four or five others on each side. Body beneath black. A narrow white line across the middle of the superciliaries; a second behind the rostral. A broad dark patch from the eye to the angle of the mouth, crossing the last two labials.

Fort Webster, and 1260, Sonora. J. H. Clark.—1249. Eagle Pass. A. Schott.—1262. Copper Mines. J. H. Clark.

82. PITYOPHIS BELLONA, B. & G.

Churchillia bellona, B. & G. Stansbury's Report, 1852, 350.
Pituophis bellona, B. & G. Catal. N. Am. Serp. Jan. 1853, 66.
Pituophis affinis, Hallowell, Pr. A. N. Sc. VI, 1852, 181.

Sp. Ch.—Head broad behind, tapering to the snout. Snout rather pointed, but less so than *P. sayi*; elevated. Crown flattened between the eyes and posteriorly. Vertical plate broad anteriorly; elongated and narrow posteriorly. Ante-orbitals two, sometimes one. Post-orbitals three or four. Frequently a supplemental plate before the vertical. Dorsal rows of scales 29 to 35, the seven outer rows smooth. Head spotted with black; transverse frontal bar extending from one orbit to the other, well marked; the oblique post-ocular vitta rather narrow. Color of the body whitish yellow. A dorsal series of 45 to 65 sub-quadrate blotches from head to anus, transversely elongated posteriorly; three or four smaller series on each side. The lateral blotches are longitudinally elongated near the head, and vertically elongated posteriorly where they form a series of jet black vertical bands. There are 10 or 15 black bands on the tail. Abdomen yellow, with an external series of black spots on each side.—(Kennicott.)

1542. 1543. Through Texas. J. H. Clark.—1546. San Bernardino to Rio San Pedro, Mexico. Dr. C. B. Kennerly.

83. ARIZONA[1] ELEGANS, Kennicott.

Plate XIII.

Sp. Ch.—Body rather more slender than in *Pityophis sayi* and *P. bellona*, and head narrower; otherwise bearing a general resemblance in form to these and other species of *Pityophis*, especially in the protruding

[1] Genus Arizona, Kennicott.—Size large. Body sub-cylindrical, deeper than wide. Head ovoid rather narrow. Snout obtusely pointed, projecting beyond the lower jaw. Eye small. Cleft of mouth curved. Cephalic plates normal. Pre-frontals elongated longitudinally; post-frontals elongated transversely. Pre-frontals extending down in front of nostrils. Rostral large, and protruding apex turned back between pre-frontals. Nostril between two plates; anterior smallest. A narrow loral as long as the post-frontals. One or two pre-orbitals, two post-orbitals. Dorsal scales all perfectly smooth, in about 29 to 31 rows. Post-abdominal scutella entire; sub-caudal all biped.

In its general aspect this genus somewhat resembles *Pityophis*, from which it differs widely, however, in its single pair of post-frontals, smooth scales, and different nasals, loral, pre-frontals, &c.—(Kennicott.)

and recurved nostril. The tail forms nearly one-sixth of the total length. Head depressed anteriorly, arched, and much more elevated posteriorly, where it is not much wider than high, nor much wider than the neck. Vertical plate sub-pentagonal, broad in front, tapering, and very acute posteriorly. Occipitals large, perfect, longer than the vertical. Superciliaries small. Pre-frontals of greater longitudinal extent than post-frontals, separated for more than two-thirds of their length by the apex of the nostril, the anterior angle extending down in front of the pre-nasal to below the level of the nostril. Post-nasal more than twice as large as pre-nasal. Loral very narrow, as long as both nasals together, and longer than the post-frontals. One ante-orbital, sometimes a second very small one below; two post-orbitals of about equal size. Two narrow and much elongated temporal shields just behind the post-orbitals, entirely filling the space between the seventh upper labial and the occipital; behind this, small scale-like temporal shields. Eight upper labials, seventh twice as large as any other. Fourteen lower labials, seventh largest. Dorsal scales in 29 to 31 rows all perfectly smooth; central rows not much smaller; outer row largest, but not as high as long.

Body whitish yellow above, with a dorsal series of transversely quadrate light olive brown blotches and two smaller lateral series on each side. Abdomen uniform clear whitish. The dorsal series of blotches are indistinctly edged with blackish; they cover three or four scales longitudinally and twelve or thirteen rows transversely, and are separated by regular intervals of one and a half scales of the ground color. The lateral blotches become more or less indistinct in age from a dark suffusion over the ground color. Each dorsal scale occupying a dark blotch is edged with lighter. In the young, the head above is light brown, with a blackish bar across the post-frontals and through the eyes to the angles of the mouth; there is also a dark blotch below the eye and some smaller ones on the crown posteriorly. In older specimens these markings become obsolete, leaving the head uniform light glossy olive brown.—(Kennicott.)

1722. Rio Grande. A. Schott.—4266. Between Arkansas and Cimarron. J. H. Clark.

84. SCOTOPHIS LINDHEIMERI, B. & G.

Scotophis lindheimeri, B. & G. Catal. N. Am. Serp. Jan. 1853, 74.

Sp. Ch.—Head broader behind and more pointed on the snout than in *S. alleghaniensis;* snout more narrow and elevated. Vertical plate as broad anteriorly as long; 27 to 29 dorsal rows, central rows distinctly carinated. A dorsal series of dark leaden brown or amber brown quadrangular blotches, with an elongated lateral series on each side. Intermediate space brownish yellow. Abdomen nearly all yellow.—(Kennicott.)

Indianola, Texas. J. H. Clark.

85. SCOTOPHIS EMORYI, B. & G.

Plate XII.

Scotophis emoryi, B. & G. Catal. N. Am. Serp. Jan. 1853, 157.

Sp. Ch.—Head narrow, elongated, widening suddenly behind the eyes. Snout elongated, narrow, elevated, and obtuse; outline anterior to the eyes sub-quadrangular. Crown flattened. Eyes very large. Vertical plate much longer than wide, narrow posteriorly, much wider in front. Superciliaries narrow. Loral large, trapezoidal, acutely angled behind. Dorsal rows 25 to 27; carination of scales very faint, barely perceptible on the central rows. Above ash-grey with a dorsal series of transverse brown blotches, on each side of which are two others of smaller size; indistinct traces of a third. A frontal brown vitta passing back through the eye and crossing the angle of the mouth on to the side of the neck. Two blotches on the upper labials which are not margined with black.—(Kennicott.)

2257. Howard Springs, Texas. J. H. Clark.—1716. Pecos to Rio Grande. Dr. C. B. Kennerly.

86. OPHIBOLUS BOYLII, B. & G.

Ophibolus boylii, B. & G. Catal. N. A. Serp. Jan. 1853, 82.
Coronella balteata, Hallowell, Pr. A. N. Sc. Jan. 1853, 236.

Gila desert. A. Schott.

87. OPHIBOLUS SPLENDIDUS, B. & G.

Plate XIV.

Ophibolus splendidus, B. & G. Catal. N. A. Serp. Jan. 1853, 83.

Sonora. J. H. Clark.—1851. Tucson, Sonora. A. Schott.

88. OPHIBOLUS SAYI, B. & G.

Coronella sayi, Holbrook, N. Am. Herp. III, 1842, 99.
Ophibolus sayi, B. & G. Catal. N. Am. Serp. 1853, 84.

1699. Indianola, Texas. J. H. Clark.

89. GEORGIA OBSOLETA, B. & G.

Plate XV.

Georgia obsoleta, B. & G. Catal. N. Am. Serp. Jan. 1853, 158. (Not *Coluber obsoletus*, of Say.)

1862, 1864. Eagle Pass and Lower Rio Grande, Texas. A. Schott and J. H. Clark.

90. BASCANION FLAVIVENTRIS, B. & G.

Coluber flaviventris, Say, Long's Exped. II, 1823, 185.
Bascanion flaviventris, B. & G. Catal. N. Am. Serp. Jan. 1853, 96.

Indianola to San Antonio. J. H. Clark.

91. MASTICOPHIS SCHOTTI, B. & G.

Plate XVIII.

Masticophis schotti, B. & G. Catal. N. Am. Serp. 1853, 160.

1972. Eagle Pass, Texas. A. Schott.

92. MASTICOPHIS ORNATUS, B. & G.

Plate XVII.

Masticophis ornatus, B. & G. Catal. N. Am. Serp. Jan. 1853, 102.

1971. San Antonio to El Paso. J. H. Clark.—1970. Howard Springs, Texas. A. Schott.

93. MASTICOPHIS TESTACEUS, B. & G.

Plate XVI.

Coluber testaceus, Say, Long's Exped. II, 1853, 48.
Psammophis flavigularis, Hallow. Pr. A. N. Sc. VI, 1852, 178.
Masticophis flavigularis, B. & G. Catal. N. Am. Serp. 1853, 99.

SP. CH.—Dorsal rows 17. Tail one-fourth the length of body. In alcohol light dull yellow, tinged with brown above. Beneath, two longitudinal series of blotches distinct anteriorly; when the epidermis is removed the whole animal appears of a soiled white. In life there is a tinge of rose color, and in some specimens the whole body is said to be nearly of a brick red.

Texas generally.

1990. Indianola. A. Schott.—2002. Presidio del Norte. J. H. Clark.—2118. Brownsville, Texas. J. H. Clark.

94. SALVADORA GRAHAMIAE, B. & G.

PLATE V, FIG. 2.

Salvadora grahamiæ, B. & G. Catal. N. Am. Serp. Jan. 1853, 104.

2081. Sonora. J. H. Clark.—2080. Presidio del Norte. J. H. Clark.—2082. Sonora. A. Schott.—2083. Northern Sonora. Dr. C. B. Kennerly.

95. LEPTOPHIS MAJALIS, B. & G.

Leptophis majalis, B. & G. Catal. N. Am. Serp. Jan. 1853.

1435. Castroville, Texas. Dr. C. B. Kennerly.—Indianola, Texas. J. H. Clark.—143. Eagle Pass, Texas. A. Schott.

96. SONORA SEMIANNULATA, B. & G.

PLATE XIX, FIG. 3.

Sonora semiannulata, B. & G. Catal. N. Am. Serp. Jan. 1853, 117.

3109. Sonora. J. H. Clark.

97. RHINOCHILUS LECONTII, B. & G.

PLATE XX.

Rhinochilus lecontii, B. & G. Catal. N. Am. Serp. Jan. 1853, 120.

2014. Pecos, Texas. A. Schott.

98. LAMPROSOMA OCCIPITALE, Hallowell.

PLATE XXI, FIG. 1.

Rhinostoma occipitale, HALLOWELL, Pr. A. N. Sc. VII, June, 1854, 95.
Lamprosoma occipitale, HALLOW. Pr. A. N. Sc. VIII, Dec. 1856, 310.

SP. CH.—Body moderately stout, tapering slightly toward the neck and considerably toward the tail, which is about one-sixth of the total length, slender, and narrowing suddenly at its base. Vertical proportionally large, tapering posteriorly. Superciliaries scarcely two-thirds as long as the vertical. Occipitals nearly as broad as long. Anterior edge of pre-orbitals concave, to receive the convex upper edge of the nasal. Loral elongated; exceedingly narrow. Orbitals small; pre-orbital quadrangular, but little higher than wide; upper post-orbital much the largest. Upper labials eight; seventh largest. Lower labials seven; fourth largest. Dorsal scales rather short and broad, disposed in fifteen rows; those of the lateral rows about as high as long; the central rows not very much smaller; the first lateral row no larger than the second and third. In the alcoholic specimen the ground color above is light greenish

yellow, tinged with dull pinkish along the vertical region; below whitish yellow, with narrow black rings entirely around the body. In life, the whole ground color above may have been pinkish. The black rings are two scales wide, and separated by regular intervals of five or six scales of the ground color throughout. The first three anterior rings do not reach the abdomen, but behind this to the tip of the tail all pass completely around the body. They are narrowest on the first lateral rows of scales and widest on the middle of the abdomen and vertebral region. On the head is an occipital crescentic blotch, passing from one eye to the other back through the middle of the occipitals.—(KENNICOTT.)

The specimens described are with some hesitation referred to *Lamprosoma occipitale*. Dr. Hallowell's type of this species differs in having only transverse dorsal bands, which do not reach the abdomen, except on the tail, in place of the perfect annulations; and these bands are only one and one-half scales wide and separated by three and a half or four scales of the ground color; the occipital crescentic blotch is broader, but does not extend to the eyes. Should these characters be permanent, the specimens described above must be referred to another species, which might with propriety be called *Lamprosoma annulatum*.

No. 2105–6. Colorado desert. A. Schott.

99. LAMPROSOMA EPISCOPUM, Kennicott.

PLATE VIII, FIG. 2.

SP. CH.—Form tapering very little toward the neck—which is not much narrower than the head—and moderately tapering toward the tail. The tail forms about one-fifth of the total length. Head rather depressed; crown flattened posteriorly. Snout broad, rounded, and depressed. Vertical a third longer than wide; scarcely tapering behind; acute posteriorly, and usually slightly concave on the sides. Superciliaries and occipitals short and narrow. Nasal elongated; nostril very small in the centre of the plate. Loral elongated; not half as large as the ante-orbital, which is itself small and vertically elongated. Post-orbitals of nearly equal size. Rostral subpentagonal; the apex acute and turned back upon the crown, entering slightly between the pre-frontals. Seven upper labials; fourth, fifth, and sixth largest and nearly equal in size, seventh very small. Lower labials seven; the fourth very much the largest. The dorsal scales in fifteen rows; they increase regularly in size from the central rows, which are much the smallest, to the first lateral row, which is higher than long. The color of the entire upper parts of head and body is uniform light olive brown, tinged with green; but on close inspection each scale is seen to be very minutely mottled with black toward the centre, and upon stretching the skin the base of each scale is black. The abdomen is uniform whitish green. In a specimen from Rio Seco the exposed base of each scale is black, giving the body somewhat of an indistinctly mottled appearance even when the skin is not stretched. The colors become lighter after soaking long in alcohol, and the black at the bases of the scales becomes more or less effaced.—(KENNICOTT.)

2042. Eagle Pass. A. Schott.—2045. San Antonio to Rio Grande. Dr. Kennerly.

100. DIADOPHIS REGALIS, B. & G.

Diadophis regalis, B. & G. Catal. N. Am. Serp. Jan. 1853, 115.

SP. CH.—Form stout. Head very short, broad behind. Eye very small. Vertical plate broad, tapering posteriorly. Dorsal scales in 17 rows. Body above uniform greenish ash; beneath light yellow, with scattered black spots. No occipital ring.—(KENNICOTT.)

2062. Sonora. J. H. Clark.—2064. Eagle Springs, Texas. J. H. Clark.

101. DIADOPHIS DOCILIS, B. & G.

PLATE XXI, FIG. 3.

Diadophis docilis, B. & G. Catal. N. Am. Serp. Jan. 1853, 114.

SP. CH.—In form, the most slender of the genus. Head rather broad behind; snout narrow; crown arched posteriorly. Eyes small. Vertical plate pentagonal, elongated, tapering but little posteriorly.

Dorsal scales proportionally small, disposed in 17 rows, the outer row scarcely largest. Color above uniform ash gray; beneath light yellow, sparsely spotted all over with black. Head dark brown above; below yellow, thickly mottled with black. As in all the western species, the color of the abdomen deepens into reddish towards the tip of the tail. A yellowish white occipital ring 2½ to 3 scales in width.—(KENNICOTT.)

2074. Devil's river, Texas. J. H. Clark.—2066. Tucson, Sonora. A. Schott.—2078. Pecos to Rio Grande. Dr. C. B. R. Kennerly.

102. TAENIOPHIS IMPERIALIS, B. & G.

PLATE XIX, FIG. 1.

Taeniophis imperialis, (B. & G.) GIRARD in Gilliss' Chile, II, 1855, 215. (Named, not described.)

SP. CH.—Form tapering anteriorly and posteriorly. Tail continuous with the body. Head proportionally narrow posteriorly, and broad on the nose; snout rounded. Rostral gibbous, twice as broad as high, the apex below the anterior frontals. Loral as high as long, and more than half as large as the anterior frontals, which are themselves about one-third the size of the post-frontals. The vertical is pentagonal, narrow, and elongated, scarcely wider anteriorly, the acute posterior point entering between the occipitals; one ante-orbital large, vertically elongated, broader above; two post-orbitals small, upper largest. Dorsal scales smooth, in 19 rows; central scales narrow and acute, outer rows much broader, especially the first. Body above deep purplish black, with two dorsal stripes of yellowish brown from head to tip of tail, and separated by a narrower vertebral line of the ground color. Head black above, with two narrow yellow lines from the nostrils to the sides of the occiput, crossing the upper angle of the orbit. Upper labials and under part of head yellowish, minutely mottled with black. Ground color of the back extending on to the ends of the abdominal scutellae. Middle of abdomen uniform light yellowish in the alcoholic specimen; said to be bright red in life.—(KENNICOTT.)

2060. Brownsville, Texas. Capt. Van Vliet.

103. TANTILLA GRACILIS, B. & G.

Tantilla gracilis, B. & G. Catal. N. Am. Serp. Jan. 1853, 132.

2040. Indianola, Texas. J. H. Clark.—2038. Eagle Pass, Texas. A. Schott.

104. TOLUCA[1] LINEATA, Kennicott.

PLATE XXI, FIG. 2.

SP. CH.—Body exceedingly stout. Tail about one-sixth of the total length. Head short, wedge-shaped, scarcely wider than the neck. Snout much depressed, acutely pointed, and projecting beyond the lower jaw. Crown arched throughout. Vertical plate very large, sub-hexagonal, the anterior extremity elongated in a narrow process to the anterior frontals, thus widely separating the post-frontals. Occipitals nearly as broad as long. Superciliaries small. Rostral proportionally large, the apex obtusely pointed, and its centre forming the acute point of the nose. Nasal pentagonal, much elongated, pointed posteriorly. One small sub-pentagonal ante-orbital, as long as high; two post-orbitals, upper slightly largest; seven upper labials, first much smaller than the second and succeeding ones; lower labials, six. Dorsal scales in 17 rows. The scales of the first lateral rows are higher than long; those of the central rows narrower; the outer row largest. Color above uniform light brownish ash, with three imperfect longitudinal blackish stripes, each on a single row of scales.

GENUS TOLUCA, Kennicott.—Size small. Body very stout, sub-cylindrical, deeper than wide. Tail short and thick. Head short and broad, wedge-shaped, almost continuous with the body. Snout pointed and projecting. Cephalic plates normal. Vertical large, sub-hexagonal, the elongated anterior angle separating the post-frontals. Occipitals shorter than vertical. Rostral turned back upon the crown, and occupying the entire point of nose. A single elongated nasal; no loral. Dorsal scales smooth. Post-abdominal scutella divided; sub-caudal all divided.

The vertebral stripe the most distinct; the lateral stripes obsolete on the fourth lateral row on each side. The stripes are formed by scales with the bases black, and the tips of the ashy ground color; the scales involved by the vertebral stripe have their tips even lighter than the ground color. Each dorsal scale appears, on close examination, to be minutely mottled with blackish, and when the skin is stretched the covered base of each scale is seen to be black. Head brownish ash, minutely mottled with blackish; labials lighter. Abdomen uniform greyish white.—(KENNICOTT.)

2103. Valley of Mexico. Dr. T. Potts.

105. RENA DULCIS, B. & G.

Rena dulcis, B. & G. Catal. N. A. Serp. Jan. 1853, 143.

San Pedro to Comanche Springs. J. H. Clark.

BATRACHIA.

105. BUFO AMERICANUS, Leconte.

Plate XXXIX, Figs. 1—4.

Bufo americanus, (Lec. mss) Holbrook, N. Am. Herp. V, 1842, 17; pl. iv.

Spec. Char.—Head above, grooved; a ridge from the snout to the occiput, hence at almost right angle to the tympanum. The ridge from either side is slightly diverging from before backwards. Skin upon the head thick, and adhering to the skull. Parotids sub-reniform. Tympanum well developed. A subgular vocal sac in the male sex. Limbs large and stout. First finger larger than the second. A large carpal corneous disk, and a small one. No membranous fold at the inner lower edge of the tarsus. Toes semi-palmated. Two metatarsal tubercles, the internal large and spade-shaped, the external small and sub-conical. Large papilla on the back. Greenish or yellowish brown above, with scattered black patches or spots. A vertebral fuscous vitta or streak. Two black patches under the eye, occasionally spotted about the nostrils and over the jaws. Beneath dirty yellowish.—(Girard.)

Atlantic States.

106. BUFO PUNCTATUS, B. & G.

Plate XXXIX, Figs. 5—7.

Bufo punctatus, B. & G. Pr. A. N. Sc. VI, Oct. 1852, 173.

Spec. Char.—Upper surface of the head flattened, with a sub-orbicular row of granules. Tip of the snout prominent. A blunt granular ridge along the sides of the upper surface. Parotid glands rounded or sub-triangular. Tympanum well developed and eventually elliptical. Eyes large. Tongue elliptical. First finger longer than the second. Two carpal disks. No membranous fold along the inner edge of the tarsus. Toes very slightly webbed at the base. Upper surface of the body covered with minute granules. Two small metatarsal tubercles. Above yellowish brown, with minute black dots over the head, body, and limbs. Granules reddish. Beneath yellowish white, with scattered minute blackish dots under the head and over the chest.—(Girard.)

Western Texas. J. H. Clark.

107. BUFO NEBULIFER, Grd.

Plate XL, Figs. 1—4.

Bufo granulosus, B. & G. Pr. A. N. Sc. VI, Oct. 1852, 173.
Bufo nebulifer, Girard, Pr. A. N. Sc. VII, May, 1854, 87.

Spec. Char.—Upper surface of head deeply excavated or concave; concavity bordered with conspicuous ridges. Skin very thin and firmly adhering to the skull. Parotid small; eyes and tympanum rather large. Tongue moderate, broadest posteriorly. Upper jaw emarginated. Inner finger much longer than the second, which is longer than the fourth. Two well developed carpal disks. No membranous fold along the tarsus. Toes semipalmated; two metatarsal tubercles. Palm of hands and sole of feet tuberculous. Yellowish brown with a dorsal broad streak of the same tint. An interocular black bar on either side of the dorsal streak extending to the whole length of the body. Sides maculated; upper part of limbs barred. Beneath unicolor in the adult, spotted in the young.—(Girard.)

Quite abundant along the shores of the Gulf of Mexico, north and south of the Rio Grande del Norte, (Rio Bravo.)

108. BUFO SPECIOSUS, Grd.

PLATE XL, FIGS. 5—10.

Bufo speciosus, GIRARD, Pr. A. N. Sc. VII, May, 1854, 86.

SPEC. CHAR.—Head moderate; its upper surface smooth and even, else showing slight traces of ridges or crests. Snout sub-truncated and rounded; nostrils sub-terminal. Mouth large; upper jaw slightly emarginated. Tongue small, elongated, free posteriorly upon the fourth of its length. A sub-gular vocal bladder in the male sex. Tympanum of medium size. Parotids sub-rhomboid, of stoutish appearance. Limbs of moderate development. First finger much longer than the second, which is equal to the fourth. A large sub-circular carpal disk. Toes semipalmated. Two metatarsal, spade-shaped processes; the innermost being much the largest. A membranous fold at the inner lower edge of the tarsus. Skin above covered with papillae of moderate development, and with small warts beneath. Color above greenish brown, maculated; no dorsal lighter vitta or streak. Beneath greenish or yellowish white, unicolor.—(GIRARD.)

Lower Rio Grande.

109. BUFO ALVARIUS, Grd.

PLATE XLI, FIGS. 1—6.

SPEC. CHAR.—Upper surface of head nearly plane upon its middle region; orbits bordered by a low and rounded off ridge; its skin being thin and adhering to the skull. Parotids well developed and subreniform. Eyes and tympanum rather large also. Tongue elongated, broadest posteriorly. Upper jaw emarginated. Two large carpal callosities. A membranous fold at the inner lower edge of the tarsus. Toes palmated; two metatarsal tubercles. Palms and soles coarsely granular. Upper surface of body exhibiting numerous glandular tubercles; large pustular swelling upon the thighs. Color uniformly dark green.—(GIRARD.)

Valley of Gila and Colorado. A. Schott.

110. BUFO HALOPHILA, B. & G.

PLATE XLI, FIGS. 7—12.

Bufo halophila, B. & G. Pr. A. N. Sc. VI, Feb. 1853, 301.

SPEC. CHAR.—Upper surface of head without either crests or grooves. Skin thick and adhering to the skull. Snout rounded. Parotids of medium size. Eyes moderate. Tympanum small. Tongue lanceolated; broadest posteriorly. Upper jaw emarginated. Inner finger longer than the second. Two carpal disks. A membranous fold along the inner edge of the tarsus. Toes semipalmated; two metatarsal tubercles. A narrow yellowish dorsal streak or vitta. Ground color greenish yellow, with numerous black spots and dots distributed all over the upper surface and sides of the body, head, and limbs. Beneath unicolor, of a dingy yellow.—(GIRARD.)

Coast of California.

111. BUFO INSIDIOR, Grd.

PLATE XLI, FIGS. 13—18.

Bufo insidior, GIRARD, Pr. A. N. Sc. VII, May, 1854, 88.

SPEC. CHAR.—Upper surface of head plane and smooth. Snout sub-acute, protruding. Mouth moderate; upper jaw slightly emarginated. Tongue elongated, tapering towards both extremities. Tympanum inconspicuous. Parotids large and elongated, obliquely situated across the shoulders. Limbs moderate

First finger equal to the second in length. A carpal disk and a tubercle. Toes slightly webbed at their base. Two metatarsal tubercles. No membranous fold at the inner lower edge of the tarsus. Skin papillous above, warty beneath. Above of a bluish slate tint with black markings. Beneath unicolor, of a dingy yellow tint.—(GIRARD.)

Chihuahua and Sonora.

112. BUFO WOODHOUSII, Girard.

Bufo dorsalis, HALLOWELL, Pr. A. N. Sc. VI, 1852, 181. (Not of Spix.)
Bufo woodhousii, GIRARD, Pr. A. N. Sc. VII, May, 1854, 86.

Sonora.

113. BUFO COGNATUS, Say.

Bufo cognatus, SAY, Long's Exped. II, 1823, 190.

Texas.

114. BUFO DEBILIS, Girard.

Bufo debilis, GIRARD, Pr. A. N. Sc. VII, May, 1854, 87.

Lower Rio Grande.

115. RANA CATESBIANA, Shaw.

Bull Frog.

Rana catesbiana, SHAW, Gen. Zool. Amphibia, 1802, 106; pl. xxxiii.
Rana pipiens, HARLAN, Sill. Am. Jour. X, 1825, 62.—HOLBROOK, N. Am. Herp. IV, 1842, 77; pl. xviii. (Not of Linnaeus.)

San Antonio, Texas. Dr. Kennerly.

116. RANA MONTEZUMAE, Baird.

PLATE XXXVI, FIGS. 1—6.

Rana montezumae, BAIRD, Pr. A. N. Sc. VII, April, 1854, 61.

SP. CH.—Head as wide as long. Body generally smooth, except pustulation on the sides and sometimes above. No fold of skin, either on the sides or around the tympanum. Tympanum about size of eye; but little variation with sexes. Large vocal vesicles on each side behind jaws. Tongue broad, cornua short. Palatine protuberances close together. Toes not webbed beyond middle of last phalanges on the external sides. Color purplish olive above, grayish below, with crowded spots or vermiculations of whitish all over the body. In young specimens, rounded, areolated, dark blotches on the back and fore leg. Size, that of *Rana pipiens* of Holbrook. (*R. catesbiana.*)

City of Mexico. Major W. Rich.

117. RANA BERLANDIERI, Baird.

PLATE XXXVI, FIGS. 7—10.

SP. CH.—Size large. Body stout, robust. Eye distant not quite 1½ times its diameter from tip of snout, and contained 2¾ times in the length of jaw from rictus. Tympanum two-thirds the diameter of the eye. A vocal vesicle on each side of the head. A glandular fold on each side the jaw, and another one broad and depressed on each side of the body. Between these is one pair of ridges along the coccyx;

several pairs more interrupted anterior to it. Skin corrugated and irregular, quite pustular in some specimens. Feet webbed from the bulb of the toes; excavated on the inner edges; last joint of longest free. Femur about half the length of body, shorter than the tibia.

Color above greenish olive, with distant sub-circular blotches of darker, scarcely areolated in the preserved specimens. Beneath yellowish white, with brown mottlings on the throat. An indistinct whitish line on the side of the head, especially in the young; the lateral ridge bronzed.

Southern Texas generally.

118. RANA AREOLATA, B. & G.

PLATE XXXVI, FIGS. 11, 12.

Rana areolata, B. & G. Pr. A. N. Sc. VI, Oct. 1852, 173.

Indianola. J. H. Clark.

119. SCAPHIOPUS COUCHII, Baird.

PLATE XXXV, FIGS. 1—6.

Scaphiopus couchii, BAIRD, Pr. A. N. Sc. VII, April, 1854, 62.

SP. CH.—Outer toe but little shorter than the third. Hand nearly as long as the forearm. Above grayish ash in alcohol, with dark markings. A dark line down the back from each orbit. Beneath white; length about one inch or more. Older specimens apparently more greenish.

Lower Rio Grande. Lieutenant Couch.

120. ACRIS CREPITANS, Baird.

PLATE XXXVII, FIGS. 14—17.

Hylodes gryllus, DEKAY, N. Y. Zool. III, 1842, 70; pl. xxii. (Not of Leconte.)
Acris crepitans, BAIRD, Pr. A. N. Sc. VII, April, 1854, 59.

SP. CH.—Brownish above. The median region of head and body above bright green; a dark triangle between the eyes. Three oblique blotches on the sides, nearly equidistant; the first behind the eye, the last on the flanks and running up on the back; all usually margined with lighter. A narrow white line from the eye to the arm. Beneath yellowish white. Inferior face of thigh plain. Tibia a little more than half the length of the body; foot rather smaller. Head rather obtuse, scarcely longer than broad. Web of hind foot extending to the penultimate articulation of the fourth toe.

Indianola, Texas. J. H. Clark.—New Braunfels. F. Lindheimer.

121. HELOECETES CLARKII, Baird.

PLATE XXXVII. FIGS. 4—9.

Heloecetes clarkii, BAIRD, Pr. A. N. Sc. VII, April, 1854, 60.

SP. CH.—Snout acute, projecting. Extremities somewhat dilated. Tibia half the distance between eye and anus. Foot but little longer, not nearly half the length of body. Above grayish brown or ash, with distinct large circular blotches. A dark band from snout through eye and tympanum down the sides, and a whitish line on the side of jaw. Body about one inch long

Indianola, Texas. J. H. Clark.

122. HYLA SEMIFASCIATA, HALLOW.

Hyla semifasciatum, HALLOW. Pr. A. N. Sc. VIII, Dec. 1856, 306.

Indianola. J. H. Clark.

123. HYLA EXIMIA, BAIRD.

PLATE XXXVIII, FIGS. 8—10.

Hyla eximia, BAIRD, Pr. A. N. Sc. VII, April, 1854, 61.

SP. CH.—Smooth above. Tibia not half the total length of body. Hind foot not longer than arm from elbow. Bluish above, with two dark longitudinal stripes; beneath white. A dark band from the eye along the sides, margined above and below by a white line, the latter reaching only to the arm, behind which the outline of the dark band is indistinct. Legs not banded. Body about an inch long.

City of Mexico. Major Rich.

124. HYLA VANVLIETII, BAIRD.

PLATE XXXVIII, FIGS. 1—3.

Hyla vanvlietii, BAIRD, Pr. A. N. Sc. VII, April, 1854, 61.

SP. CH.—Nearly smooth above. Tympanum nearly as large as the eye. Tibia half as long as the body, longer than arm from elbow, which in turn exceeds the foot. Ash gray or olive, with an irregular cruciform dorsal blotch. A black spot on the side above the foreleg. A white spot under the eye. Thigh and leg with three transverse bands each. Their inner surfaces (when flexed) scarcely reticulated but spotted with white upon a darker ground. Inside of tibia uncolored. Body two inches long.

Brownsville, Texas. Captain Van Vliet.

125. HYLA AFFINIS, BAIRD.

PLATE XXXVIII, FIGS. 4—7.

Hyla affinis, BAIRD, Pr. A. N. Sc. VII, April, 1854, 61.

SP. CH.—Body rough. Tympanum two-thirds the size of eye. Tibia not quite half the length of the body, but reaching more than half way from anus to centre of eyes. Color ash grey or green, with numerous rounded dorsal blotches. Three transverse bands on each thigh and leg. No vermiculation on anterior and posterior faces of hind legs, nor on lower part of sides. A light spot under the eye. Web of hand extending only to the third joint of the second finger. Arm from elbow less than tibia, but longer than hind foot. About 1½ inches long.

Northern Sonora. J. H. Clark.

126. AMBLYSTOMA PROSERPINA, B. & G.

PLATE XXXV, FIGS. 7—14.

Amblystoma proserpina, B. & G. Pr. A. N. Sc. VI, Oct. 1852, 173.

Salado river, Texas.

127. AMBLYSTOMA TEXANUM, BAIRD.

PLATE XXXV, FIG. 15.

? *Salamandra texana*, MATTHES, Allg. Deut. Nat. Zeitung, I, 1855, 266.

Lower Rio Grande.

128. SIREN LACERTINA, L.

Lower Rio Grande, Texas.

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PLATE XVII.——*Masticophis ornatus*, B. & G.

PLATE XVIII.—*Masticophis schotti*, B. & G.

PLATE XIX.——FIG. 1.—*Taeniophis imperialis*, B. & G.
FIG. 2.—*Diadophis regalis*, B. & G.
FIG. 3.—*Sonora semiannulata*, B. & G.

PLATE XX.——*Rhinocheilus lecontii*, B. & G.

PLATE XXI.——FIG. 1.—*Lamprosoma occipitale*, Hallow.
FIG. 2.—*Toluca lineata*, Kennicott.
FIG. 3.—*Diadophis docilis*, B. & G.

PLATE XXII.——Skulls of serpents—
FIG. 1.—*Salvadora grahamiae*, B. & G.
FIG. 2.—*Dipsas septentrionalis*, Kenn.
FIG. 3.—*Eutaenia saurita*, B. & G.
FIG. 4.—*Eutaenia marciana*, B. & G.
FIG. 5.—*Bascanion constrictor*, B. & G.
FIG. 6.—*Georgia obsoleta*, B. & G.
FIG. 7.—*Masticophis testaceus*, B. & G.

PLATE XXIII, FIGS. 1—8. *Phyllodactylus tuberculosus*, Wieg. No. 3208.—Fig. 1, animal; fig. 2, head from side; fig. 3, head from above; fig. 4, head from below; fig. 5, inguinal region; fig. 6, under surface of left hand; fig. 7, toe from above, showing the short claw; fig. 8, skin of back. All magnified except fig. 1. Female.

FIGS. 9—18. *Stenodactylus variegatus*, Baird. Female. No. 3217.—Figs. 10, 11, 12, head from different views; fig. 13, inguinal region; fig. 14, a hind toe; and fig. 16, a finger from below, (not quite accurately represented;) fig. 15, hand from below; fig. 17, skin of back; and 18, skin of belly. All magnified except fig. 9.

FIGS. 19—27. *Stenodactylus variegatus*, Baird. Male. No. 3213—References as above; figure of skin of belly wanting. The under surfaces of the toes and fingers, figs. 24, 26, not quite accurate. All magnified except fig. 19.

PLATE XXIV, FIGS. 1—10. *Gerrhonotus webbii*, Baird. Young.—Fig. 1, animal; figs. 2, 3, 4, views of head; fig. 5, upper surface of left hand; fig. 6, tip of a finger, highly magnified; fig. 7, upper surface of left hind foot; fig. 8, portion of belly; fig. 9, portion of the side, showing the lateral fold. All magnified except fig. 1.

FIGS. 11—19. *Stenodactylus variegatus*, Baird. Young.—Fig. 11, animal; figs. 12, 13, 14, views of head; fig. 15, left hand from above; fig. 16, tip of finger; fig. 17, left hind foot from above; fig. 18, portion of back; fig. 19, portion of belly. All magnified except fig. 11.

FIGS. 20—28. *Plestiodon guttulatus*, Hallowell. Young.—Fig. 20, animal; figs. 21, 22, 23, views of head; fig. 24, left hand from above; fig. 25, left foot from above; fig. 26, its longest toe, much magnified; fig. 27, scales of back; and fig. 28, of belly. Fig. 20, natural size of specimen; the others magnified.

FIGS. 29—37. *Sphaeriodactylus notatus*, Baird.—Fig. 29, animal; figs. 30, 31, 32, views of the head; fig. 33, left hand from above; fig. 34, a digit from below; fig. 35, left foot from above; fig. 36, scales of back; fig. 37, scales of belly. Fig. 29, natural size; the others magnified.

PLATE XXV, FIGS. 1—8. *Gerrhonotus nobilis*, Baird.—Fig. 1, animal; fig. 2, head from above; fig. 3, eyelids; fig. 4, head and arm from below; fig. 5, anal region; fig. 6, scales of back; fig. 7, scales of side; fig. 8, scales of belly. Figs. 3, 6, 7, and 8, magnified.

FIGS. 9—16. *Plestiodon obsoletus*, B. & G.—Fig. 9, animal; fig. 10, head from above; fig. 11, eyelids; fig. 12, (right hand side,) head from below; fig. 12, (left hand side,) arm from below; fig. 14, inguinal region and hind leg from below; fig. 15, scales of back; fig. 16, scales of belly. Figs. 11, 15, 16, magnified.

PLATE XXVI, FIGS. 1—10. *Heloderma horridum*, Wiegm. No. 2791.—Fig. 1, animal; fig. 2, head from below; fig. 3, auditory aperture; fig. 4, anal region; fig. 5, fore finger from the side; fig. 6, fore finger from below; fig. 7, hind toe from the side; fig. 8, hind toe from below; fig. 9, skin of back; fig. 10, skin of belly.

PLATE XXVII, FIGS. 1—12. *Euphryne obesus*, Baird.—Fig. 1, animal; fig. 2, head from above; fig. 3, head from below; fig. 4, anal region; fig. 5, fore finger from below; fig. 6, fore finger from the side; fig. 7, hind toe from below; fig. 8, hind toe from the side.

PLATE XXVIII.—FIGS. 1—3. *Phrynosoma regale*, Girard.

FIGS. 4—6. *Doliosaurus m'callii*, Girard.

PLATE XXIX.—FIGS. 1—3. *Sceloporus poinsettii*, B. & G.

FIGS. 4—6. *? Sceloporus spinosus*, Wiegm.

PLATE XXX.—FIGS. 1—2. *Holbrookia texana*, B. & G. Male.

FIGS. 3—7. *Holbrookia texana*, B. & G. Female.—Fig. 3, animal; fig. 4, head from above; fig. 5, palpebral region; fig. 6, inferior surface of body; fig. 7, dorsal scales, much magnified.

PLATE XXXI, FIGS. 1—8. *Crotaphylus wislizenii*, B. & G. No. 2685.—Fig. 1, animal; fig. 2, head from above; fig. 3, head from the side; fig. 4, inferior surface of body; fig. 5, a fore finger from the side; fig. 6, a hind toe from the side; fig. 7, dorsal scales; fig. 8, a femoral pore. All magnified, except figs. 1 and 4.

PLATE XXXII, FIGS. 1—6. *Cnemidophorus grahamii*, B. & G. No. 3046*b*.—Fig. 1, animal; fig. 2, head from above; fig. 3, palpebral region; fig. 4, under surface of body; fig. 5, scales of back; fig. 6, femoral pore; figs. 3, 5, and 6 magnified.

FIGS. 7—13. *Dipsosaurus dorsalis*, Hallow. No. 2699.—Fig. 7, animal; fig. 8, side of head; fig. 9, head from above; fig. 10, head from beneath; fig. 11, anal region, under surface of hind leg; fig. 12, side view of a fore finger; fig. 13, side view of a hind toe. All magnified except fig. 1.

PLATE XXXIII, FIGS. 1—8. *Cnemidophorus tigris*, B. & G. No. 3061. California.—Fig. 1, animal; fig. 2, head from above; fig. 3, head from the side; fig. 4, under surface of body; fig. 5, side view of a fore finger; fig. 6, side view of a hind toe; fig. 7, scales of side; fig. 8, a femoral pore. All magnified, except fig. 1.

N. B. The division of the loral plate into two, as seen in fig. 3, is unusual, the narrow linear one superposed on the larger being almost peculiar to the specimen figured.

PLATE XXXIV, FIGS. 1—6. *Cnemidophorus gularis*, B. & G.—References as in preceding cases, fig. 3 being the palpebral region, and fig. 6 the scales of sides and belly.

FIGS. 7—14. *Cnemidophorus gracilis*, B. & G. No. 3034.

PLATE XXXV, FIGS. 1—6. *Scaphiopus couchii*, Baird. Adult.

FIGS. 7—14. *Amblystoma proserpina*, B. & G.—Fig. 7, animal; figs. 8, 9, 10, views of head; fig. 11, open mouth, showing the tongue; fig. 12, roof of mouth magnified; fig. 13, palm of hand; fig. 14, sole of foot.

FIG. 15. *Amblystoma texana*, Baird.

PLATE XXXVI, FIGS. 1—4. *Rana montezumae*, Baird. Adult.

FIGS. 5, 6. *Rana montezumae*, Baird. Young.

FIGS. 7—10. *Rana berlandieri*, Baird.

FIGS. 11, 12. *Rana areolata*, B. & G.

PLATE XXXVII, FIGS. 1—3. *Batrachyla longipes*, Baird. Mexico.

FIGS. 4—9. *Heloecetes clarkii*, Baird.

FIGS. 10—13. *Hylarana fusca*, Baird.

FIGS. 14—17. *Acris acheta*, Baird.

PLATE XXXVIII, FIGS. 1—3. *Hyla vanvlietii*, Baird.

FIGS. 4—7. *Hyla affinis*, Baird.

FIGS. 8—10. *Hyla eximia*, Baird.

FIGS. 11—13. *Hyla vociferans*, Baird.

PLATE XXXIX, FIGS. 1—4. *Bufo americanus*, Lec.

FIGS. 5—9. *Bufo punctatus*, B. & G.

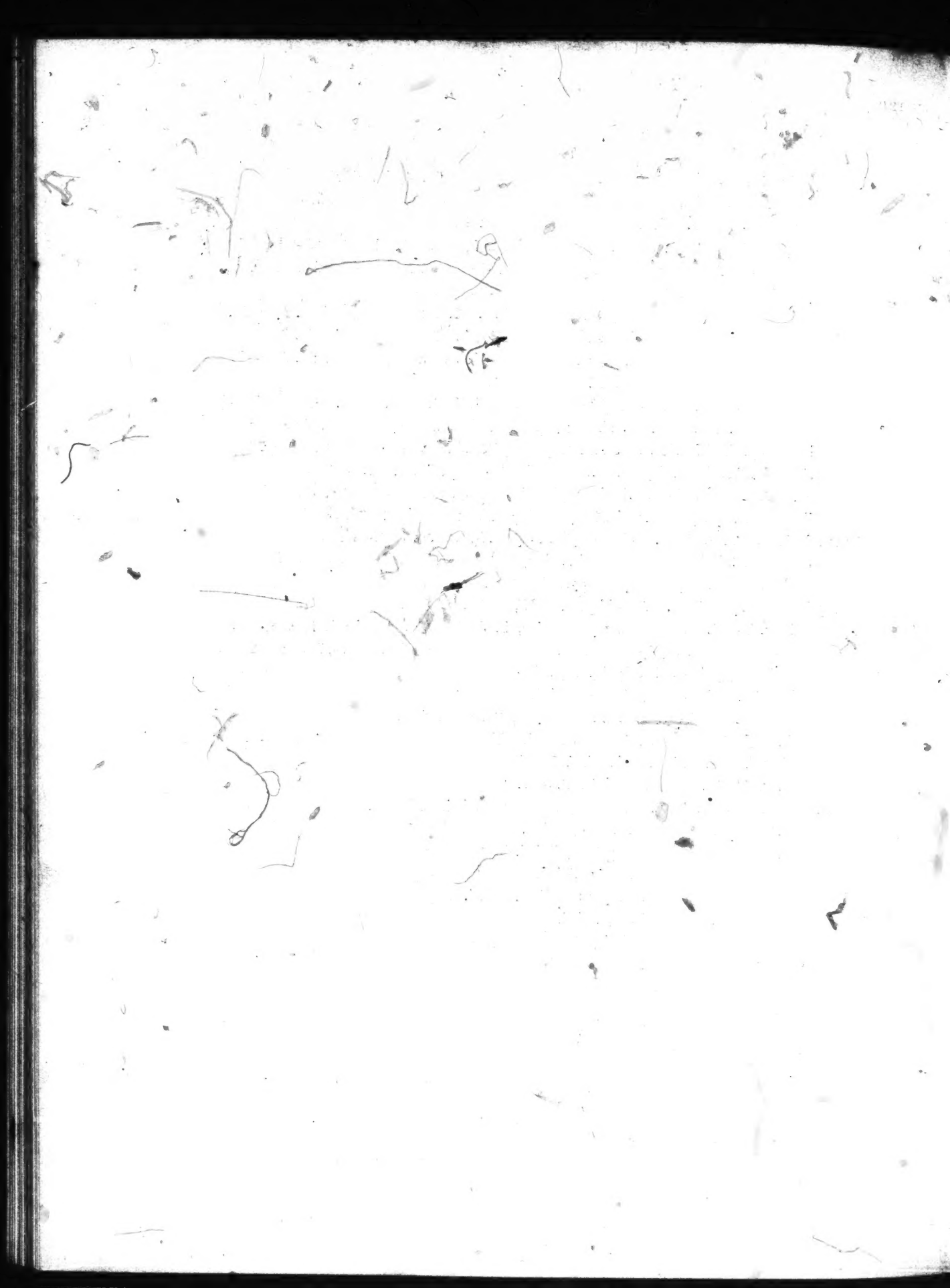
PLATE XL, FIGS. 1—4. *Bufo nebulifer*, Girard.

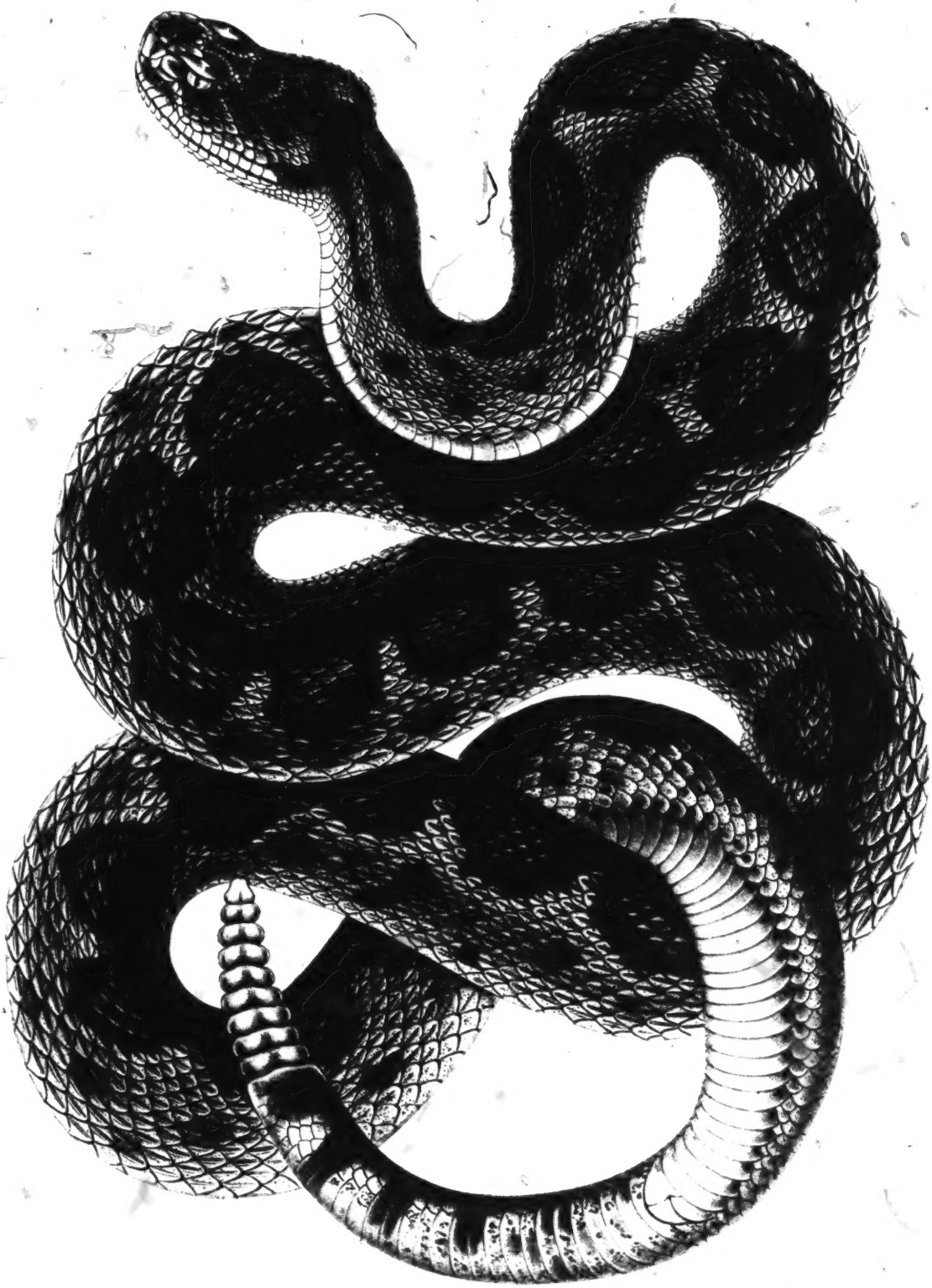
FIGS. 5—11. *Bufo speciosus*, Girard.

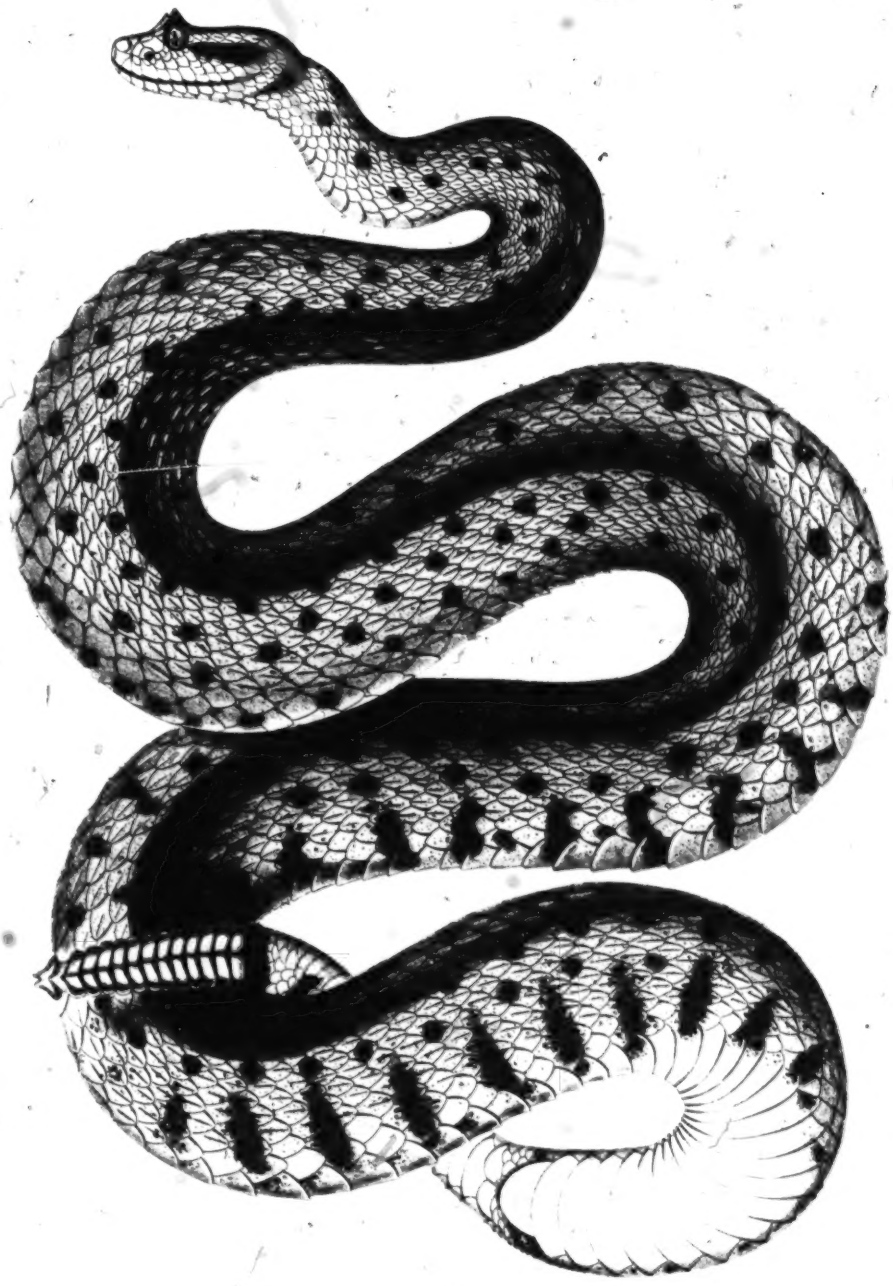
PLATE XLI, FIGS. 1—6. *Bufo alvarius*, Girard.

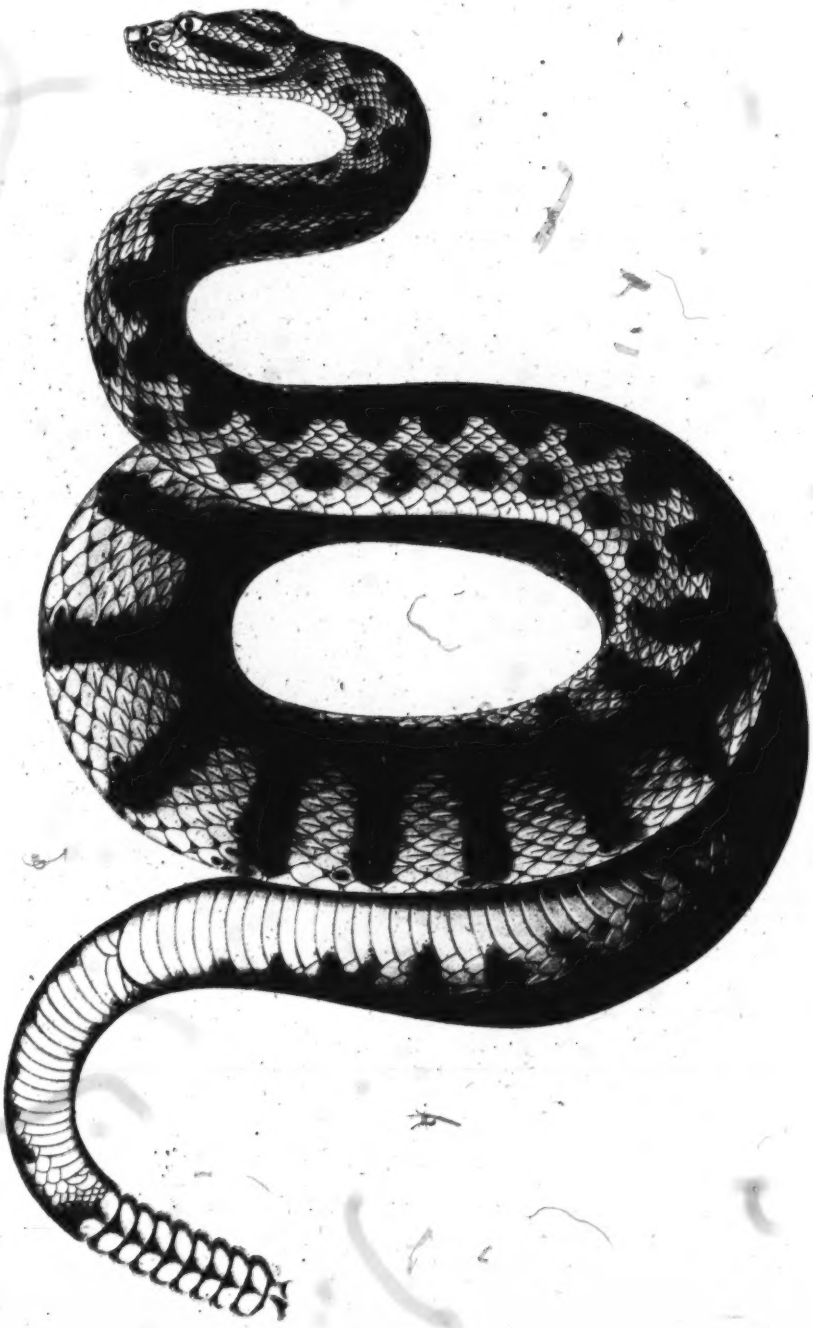
FIGS. 7—12. *Bufo halophila*, B. & G.

FIGS. 13—18. *Bufo insidior*, Girard.









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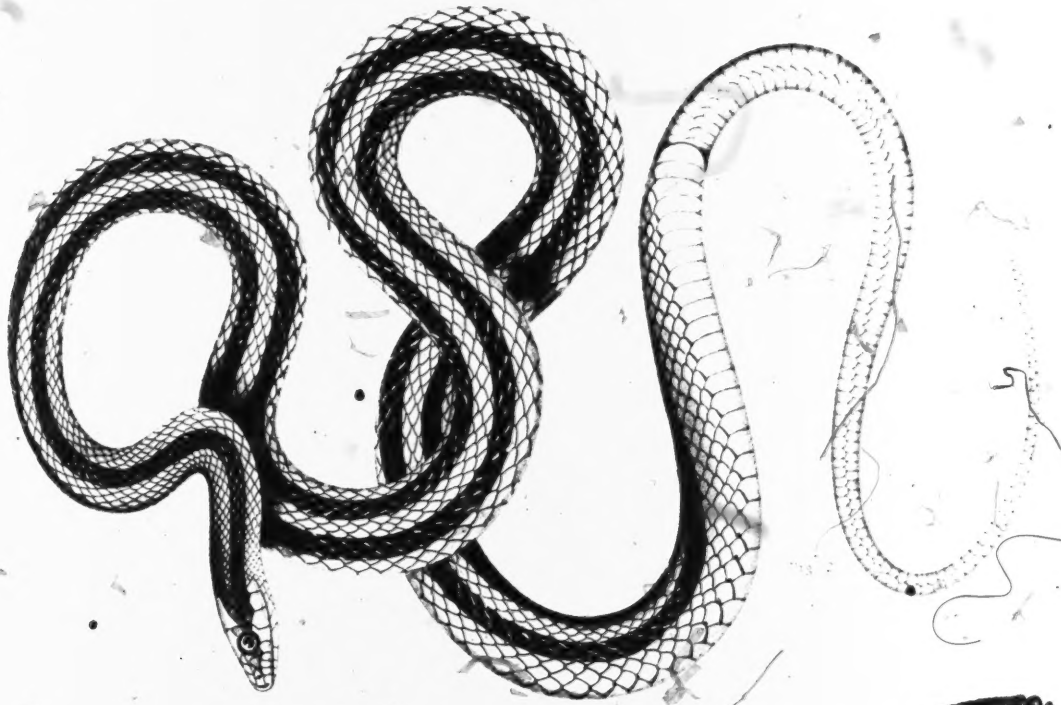


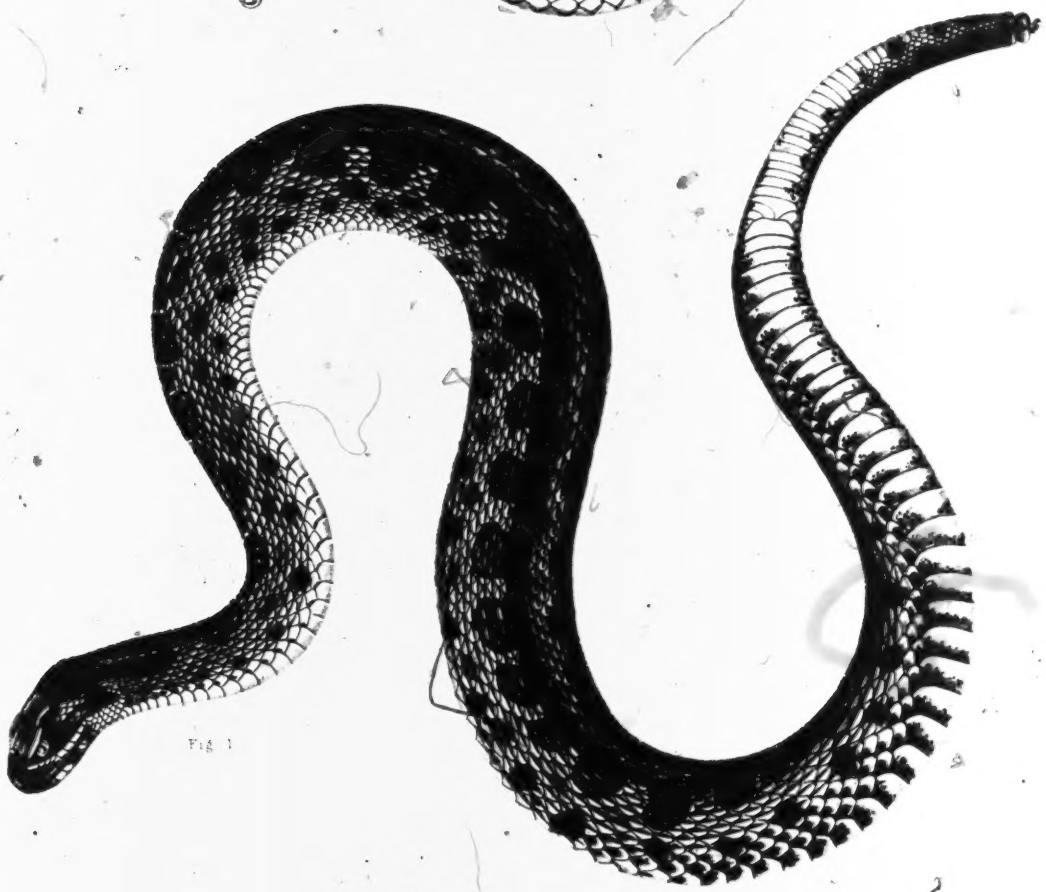
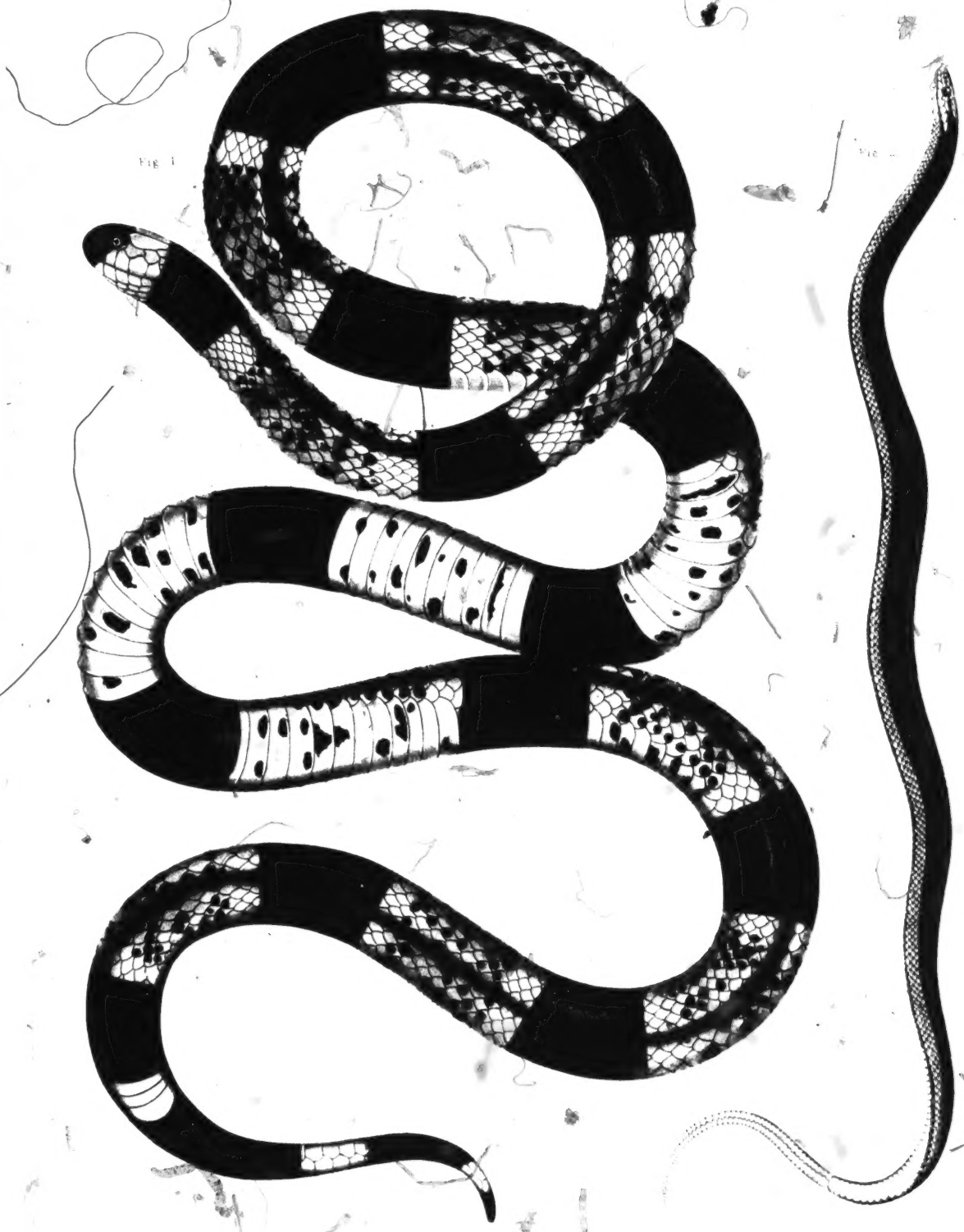
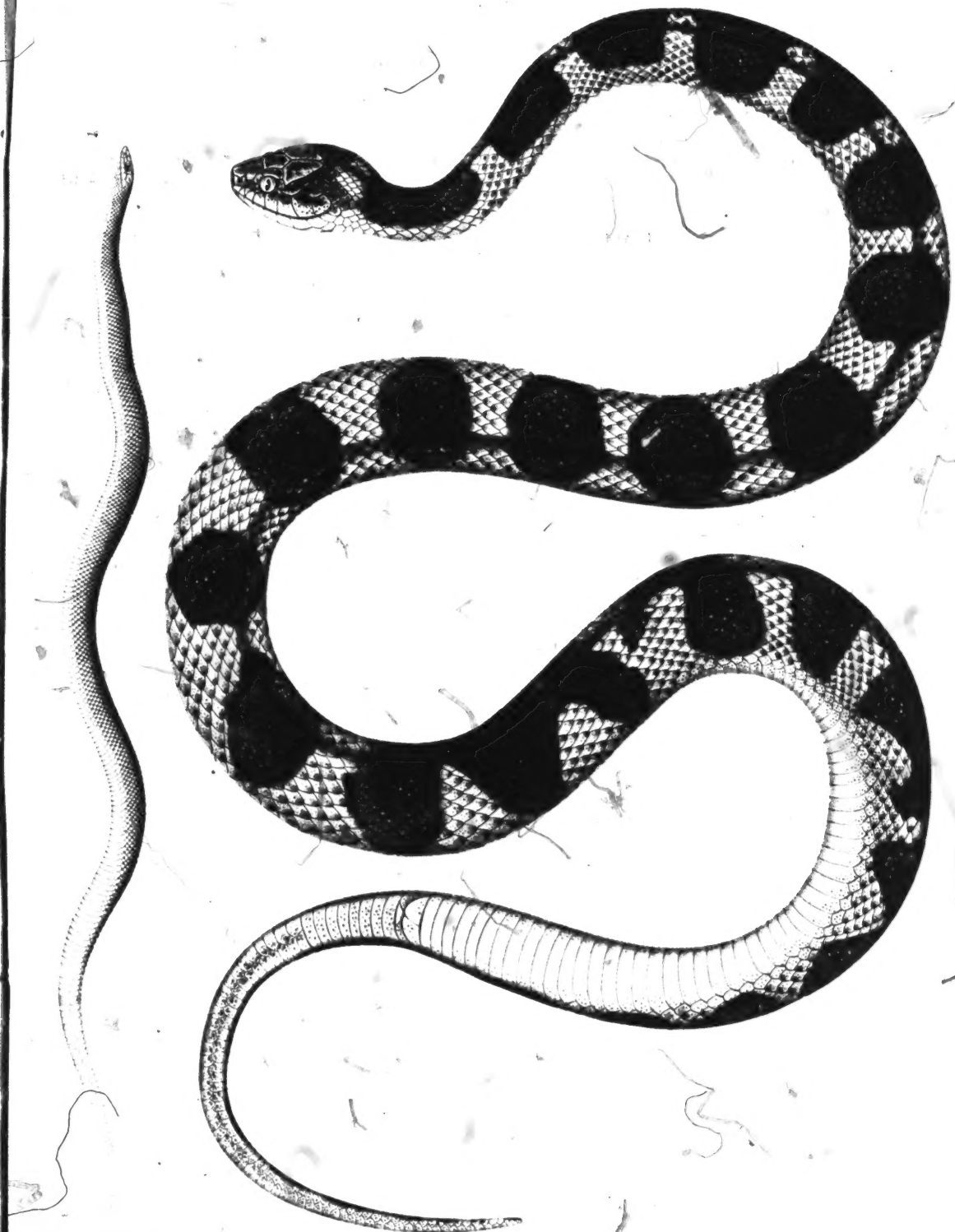
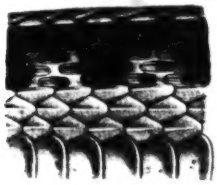
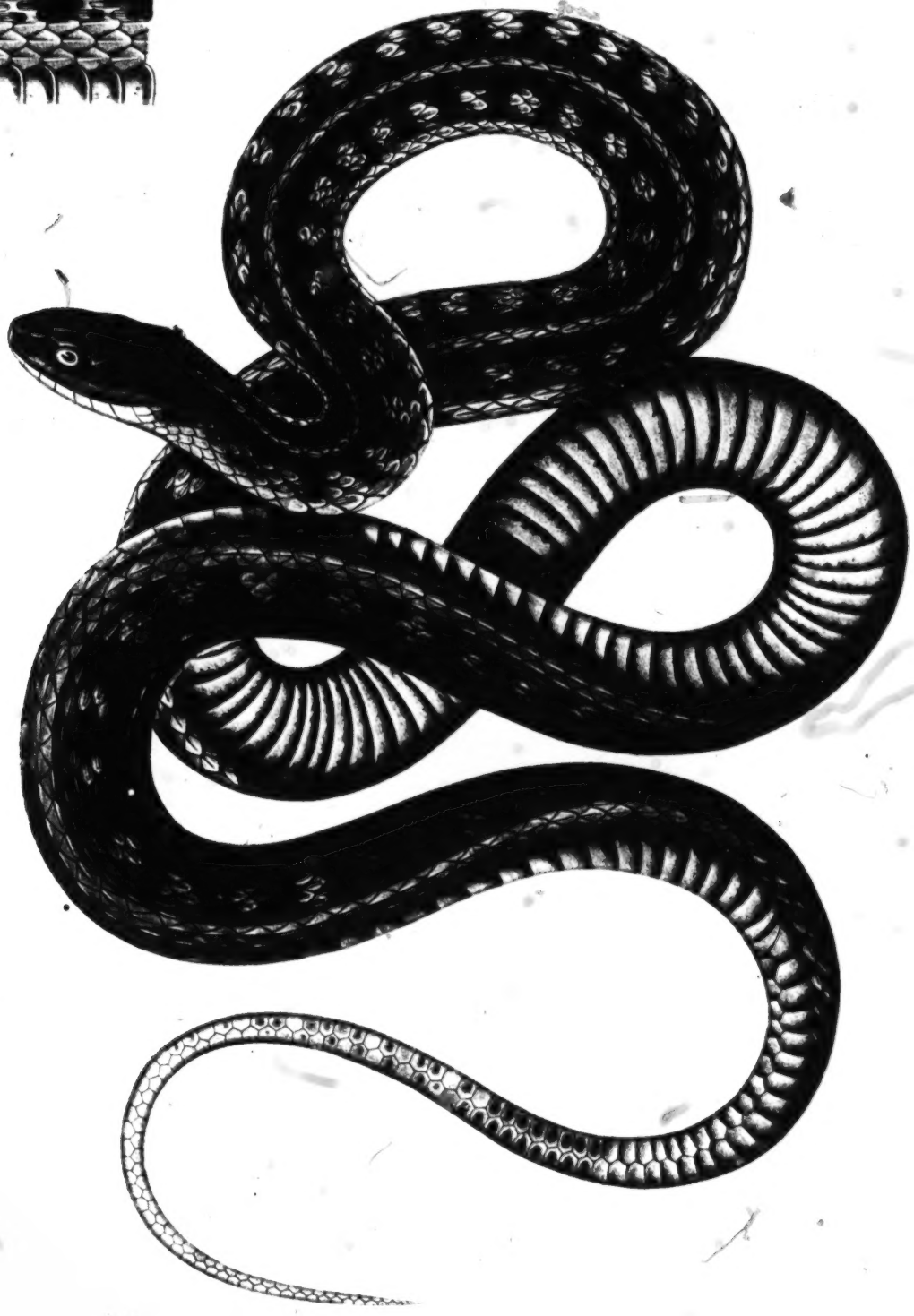


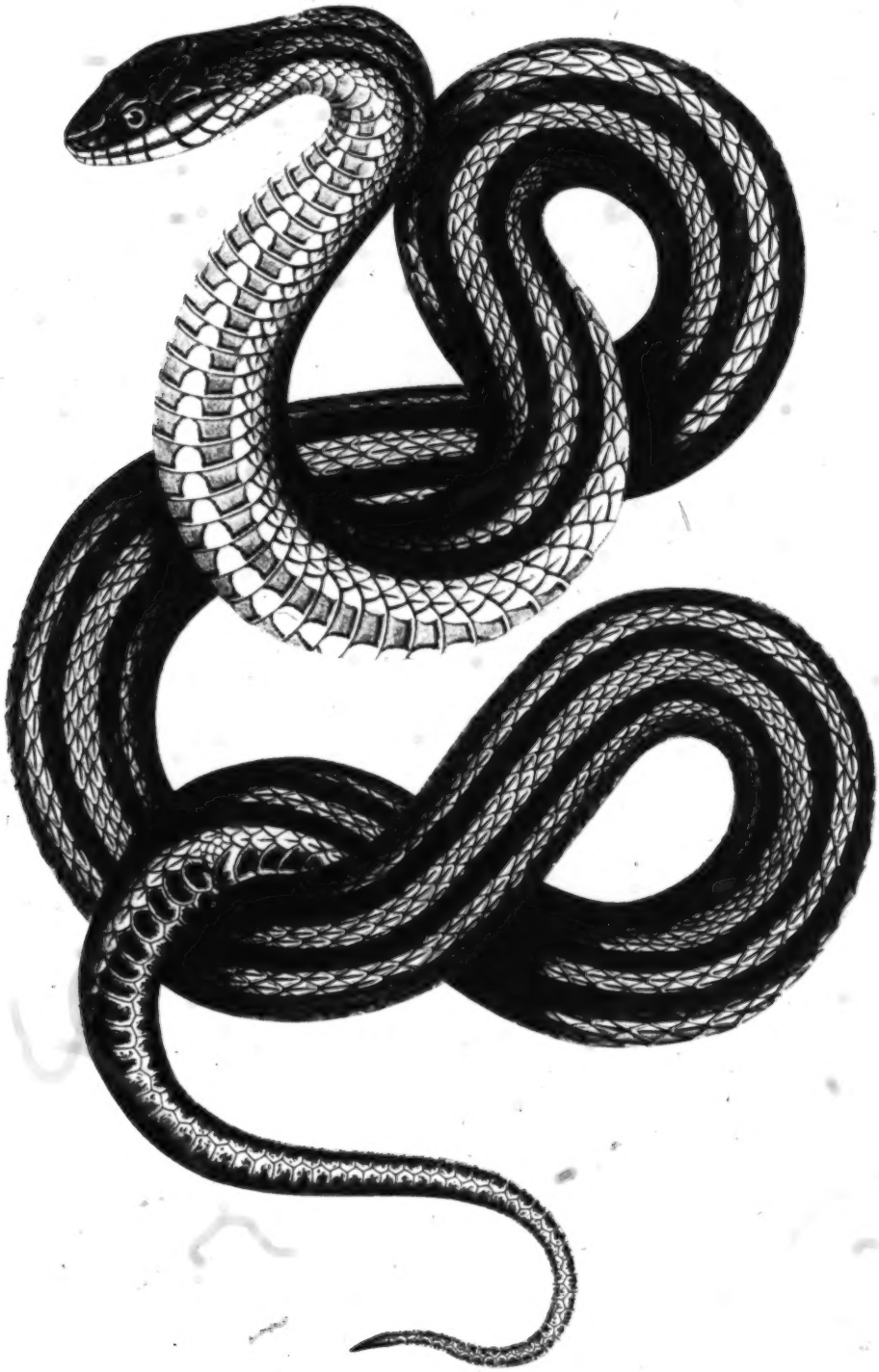
Fig 1











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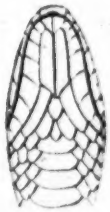

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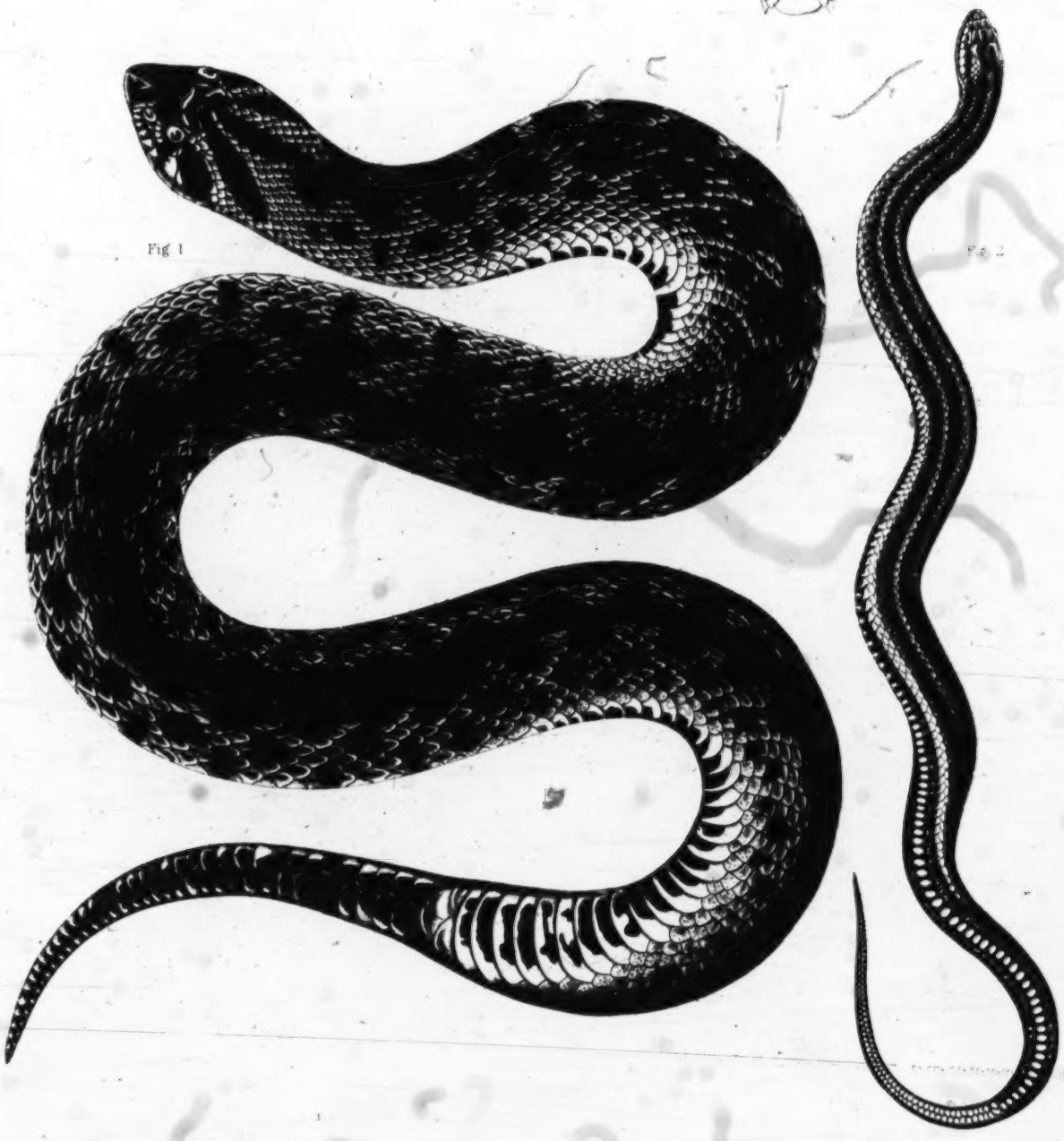
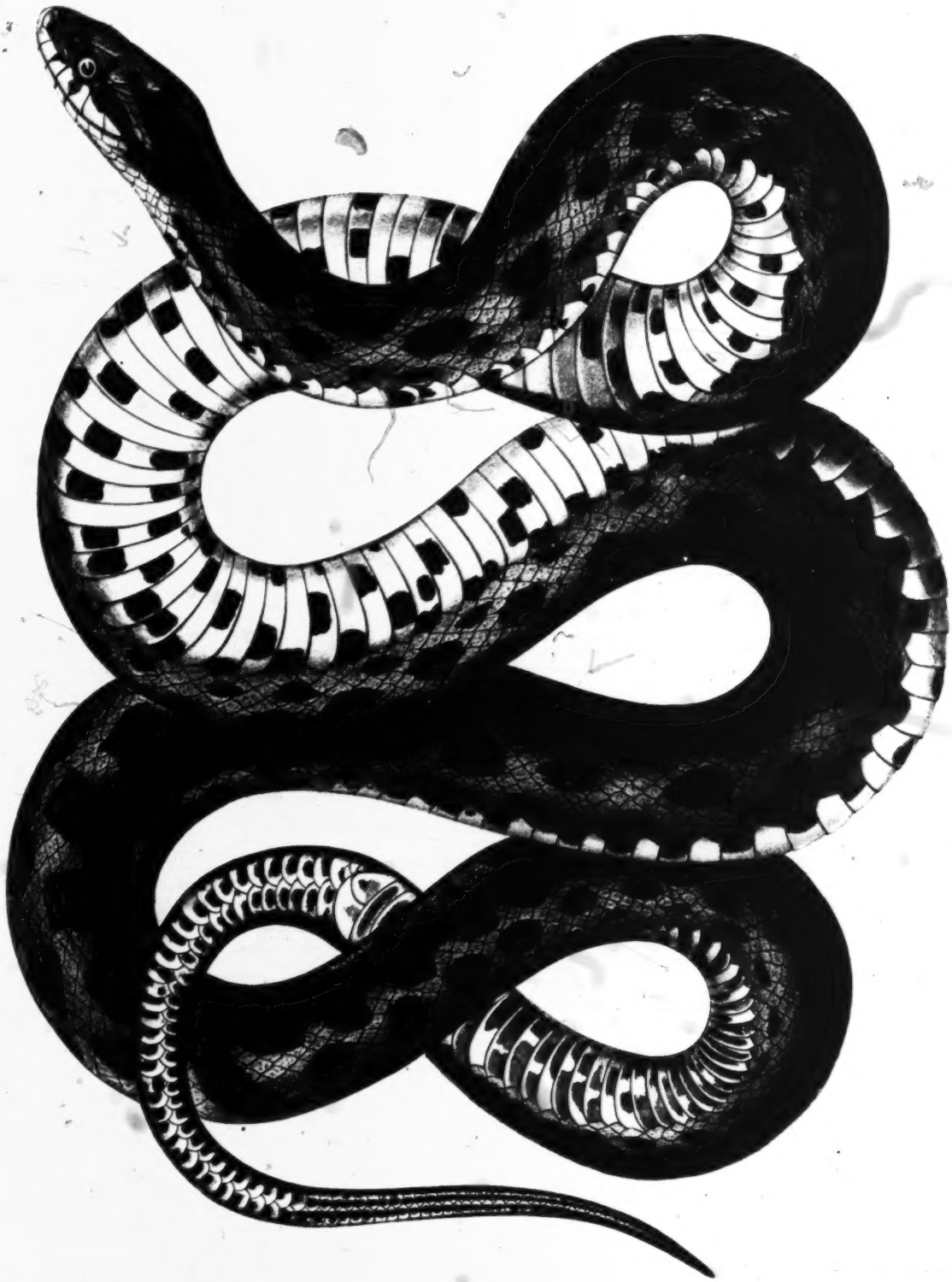
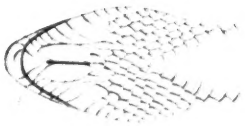
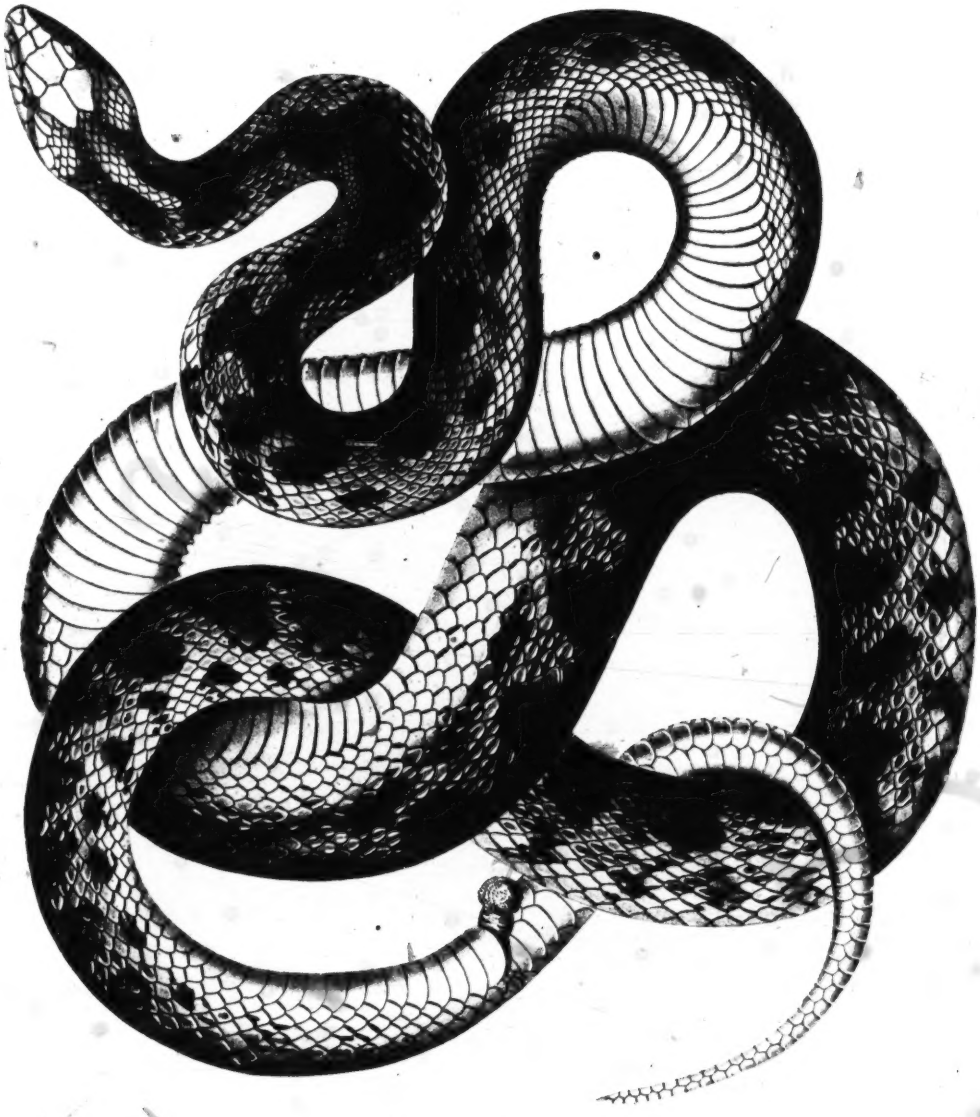


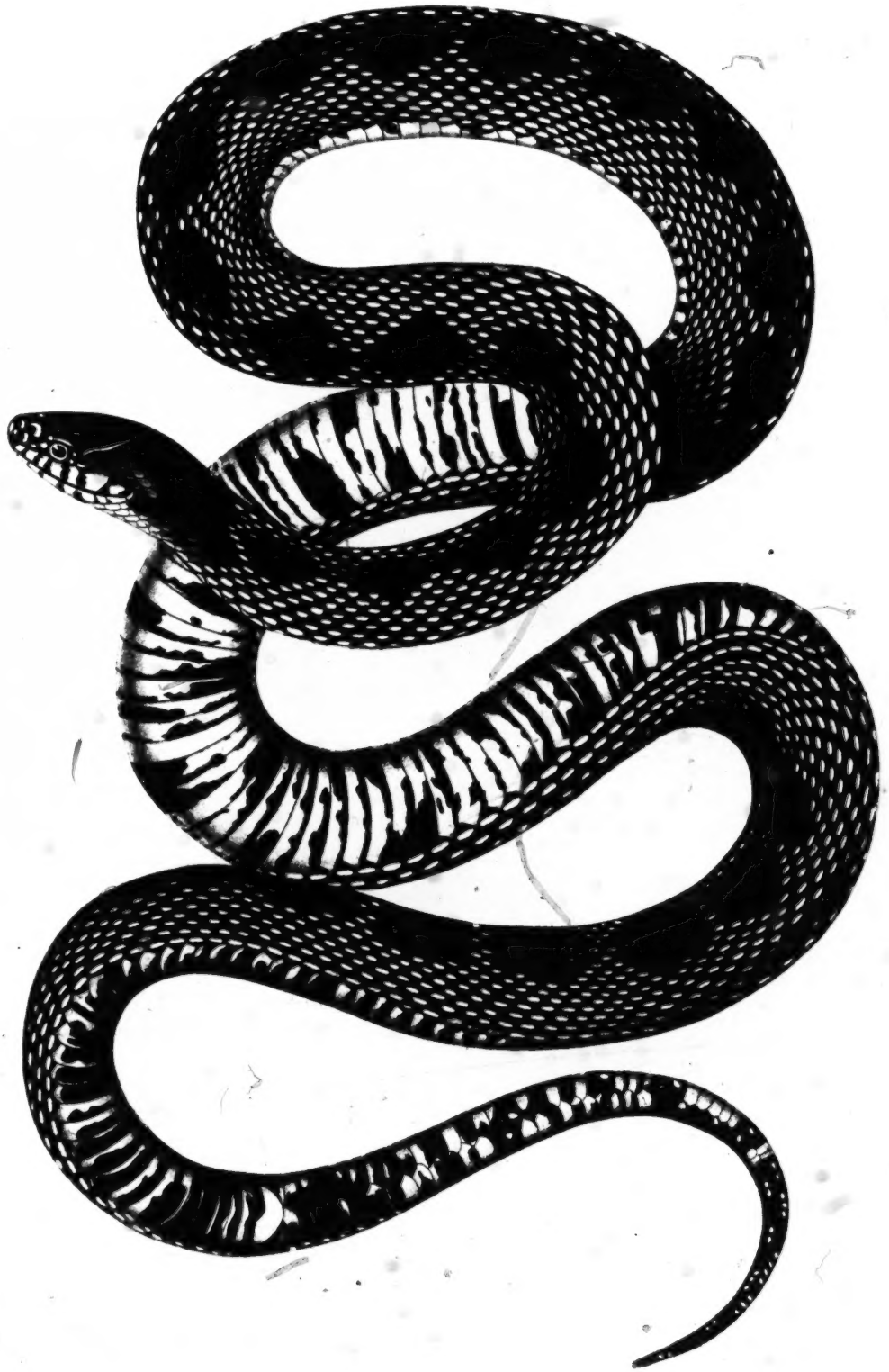
Fig 1

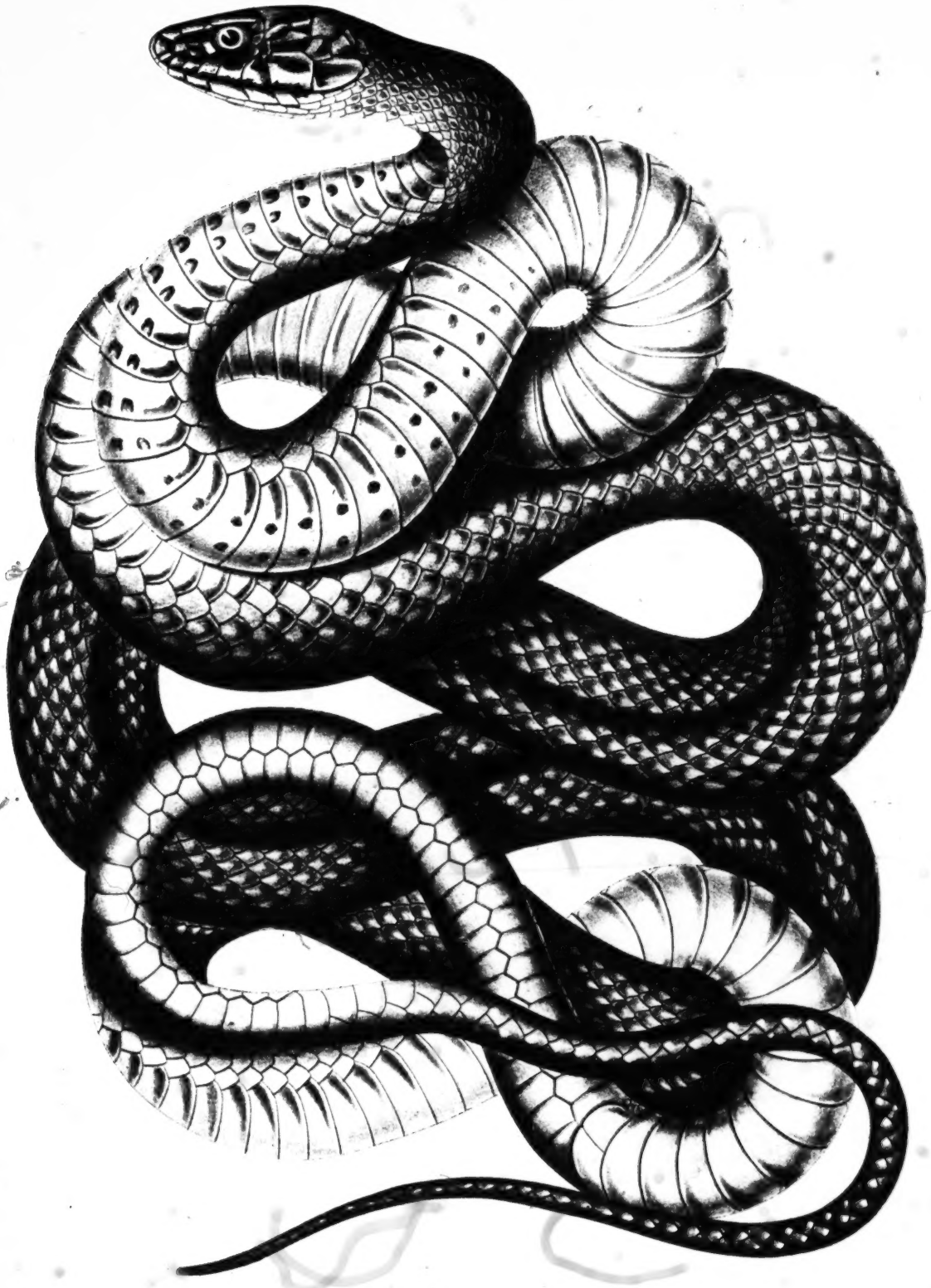
Fig 2

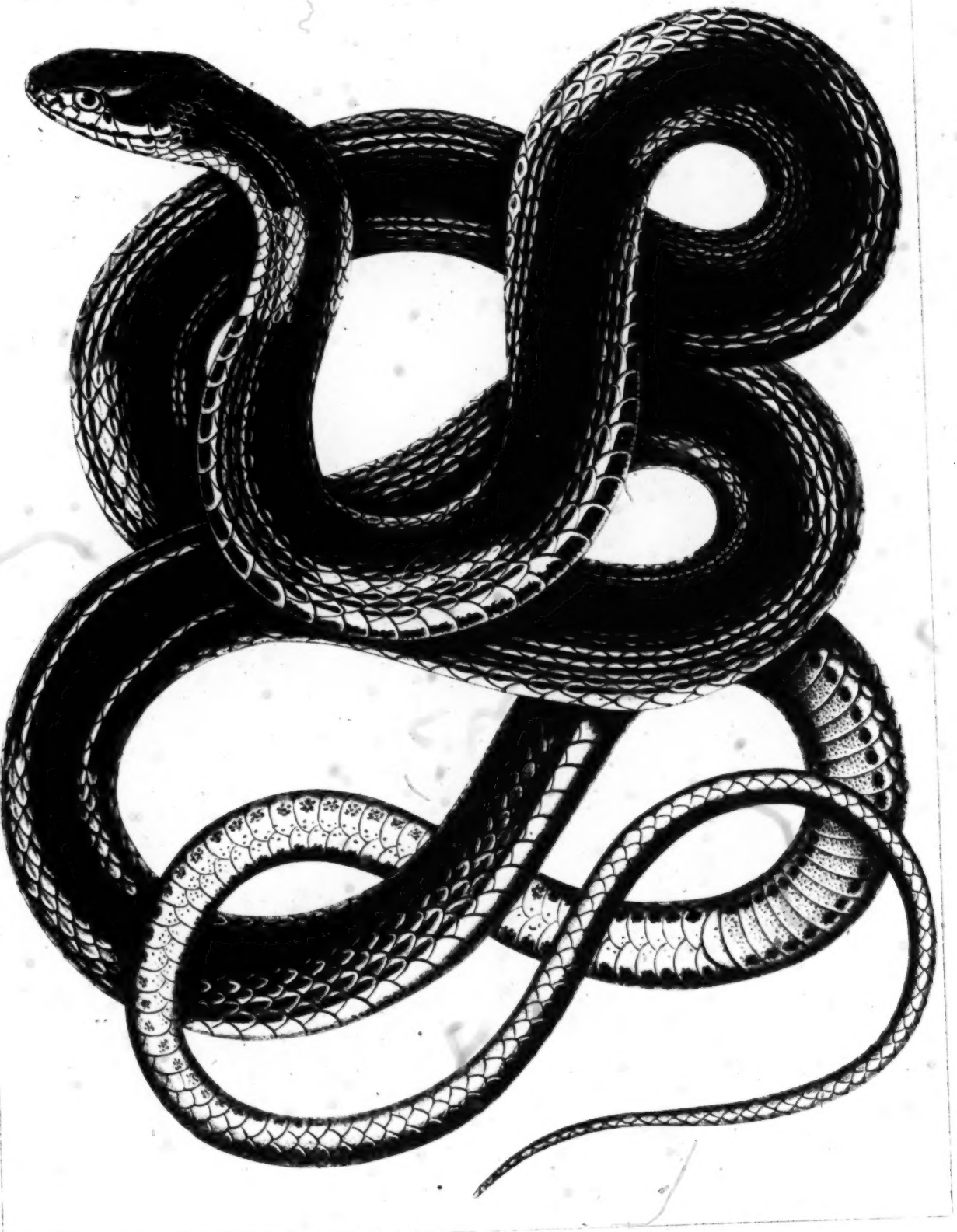


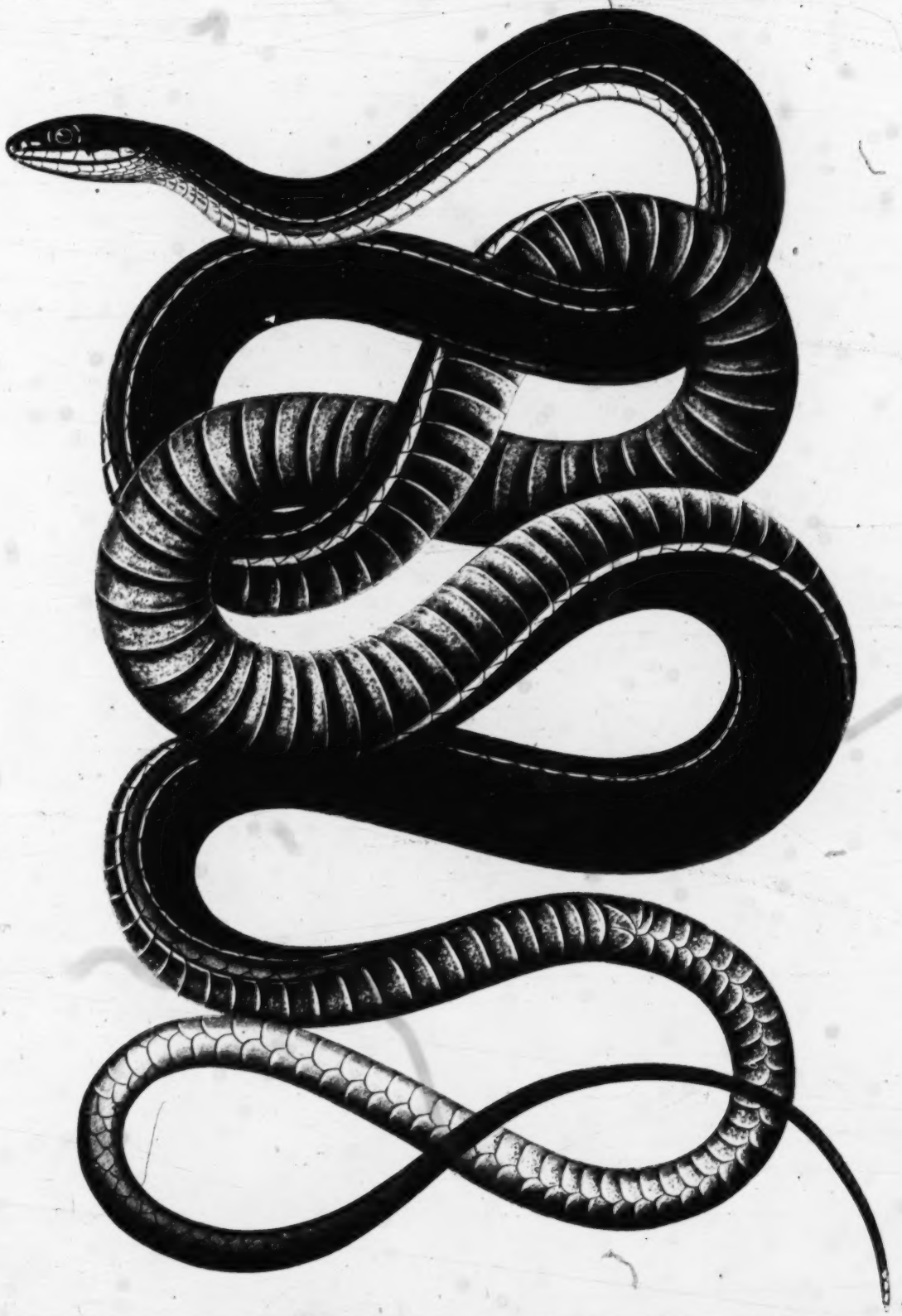












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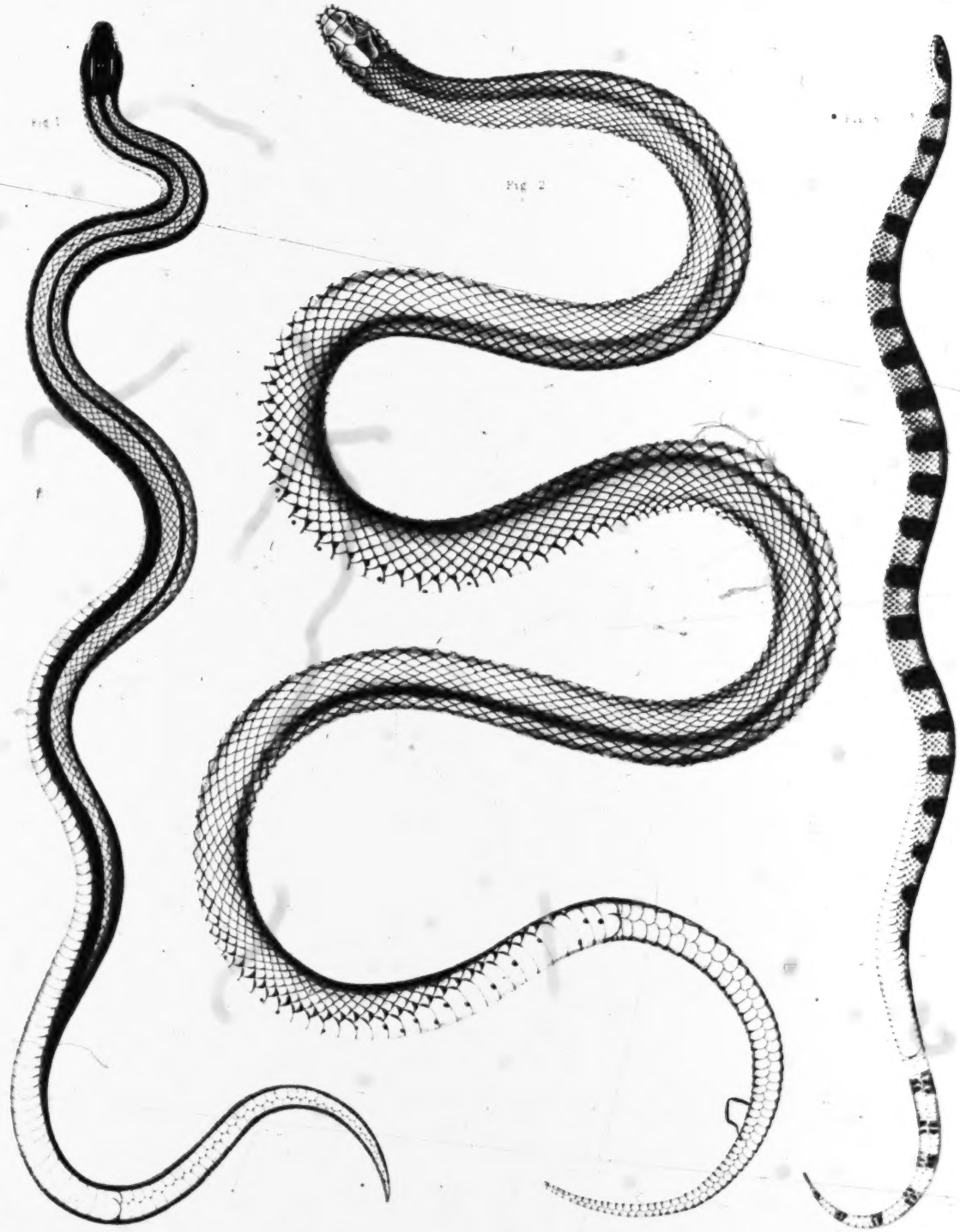

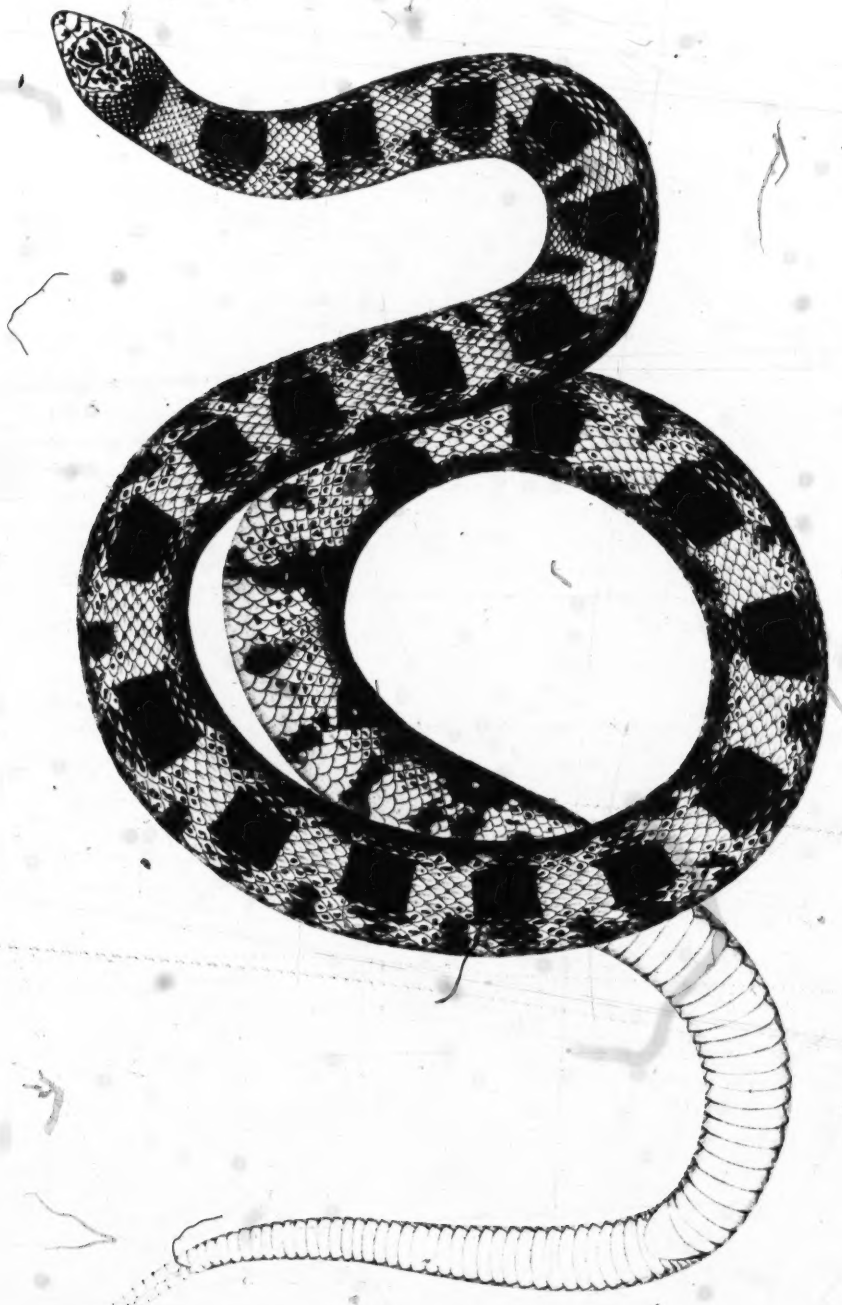

Fig 1

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Fig 3

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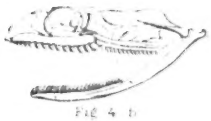
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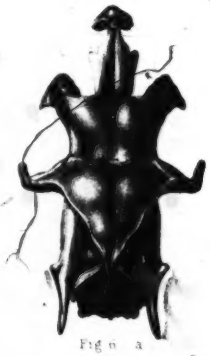
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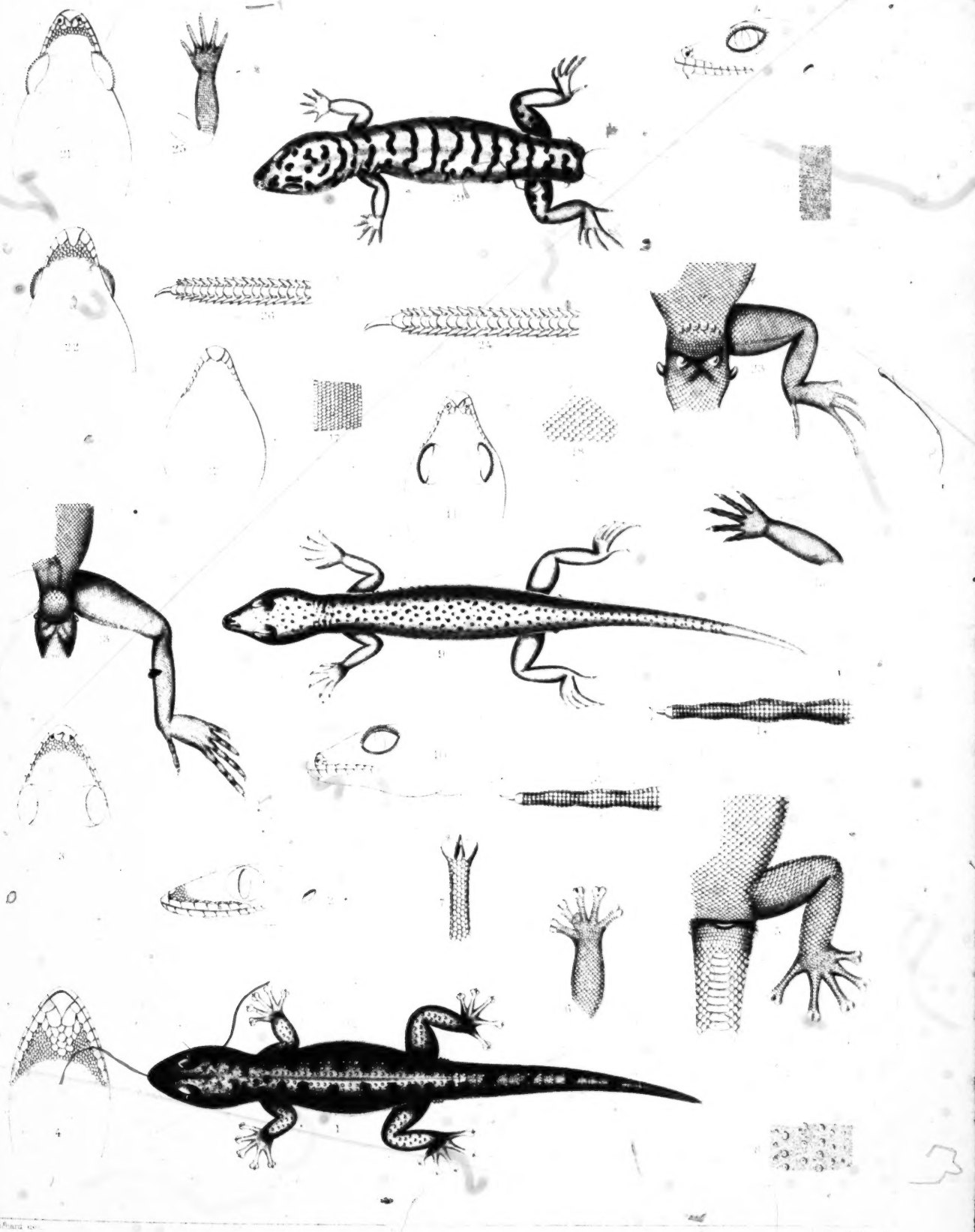

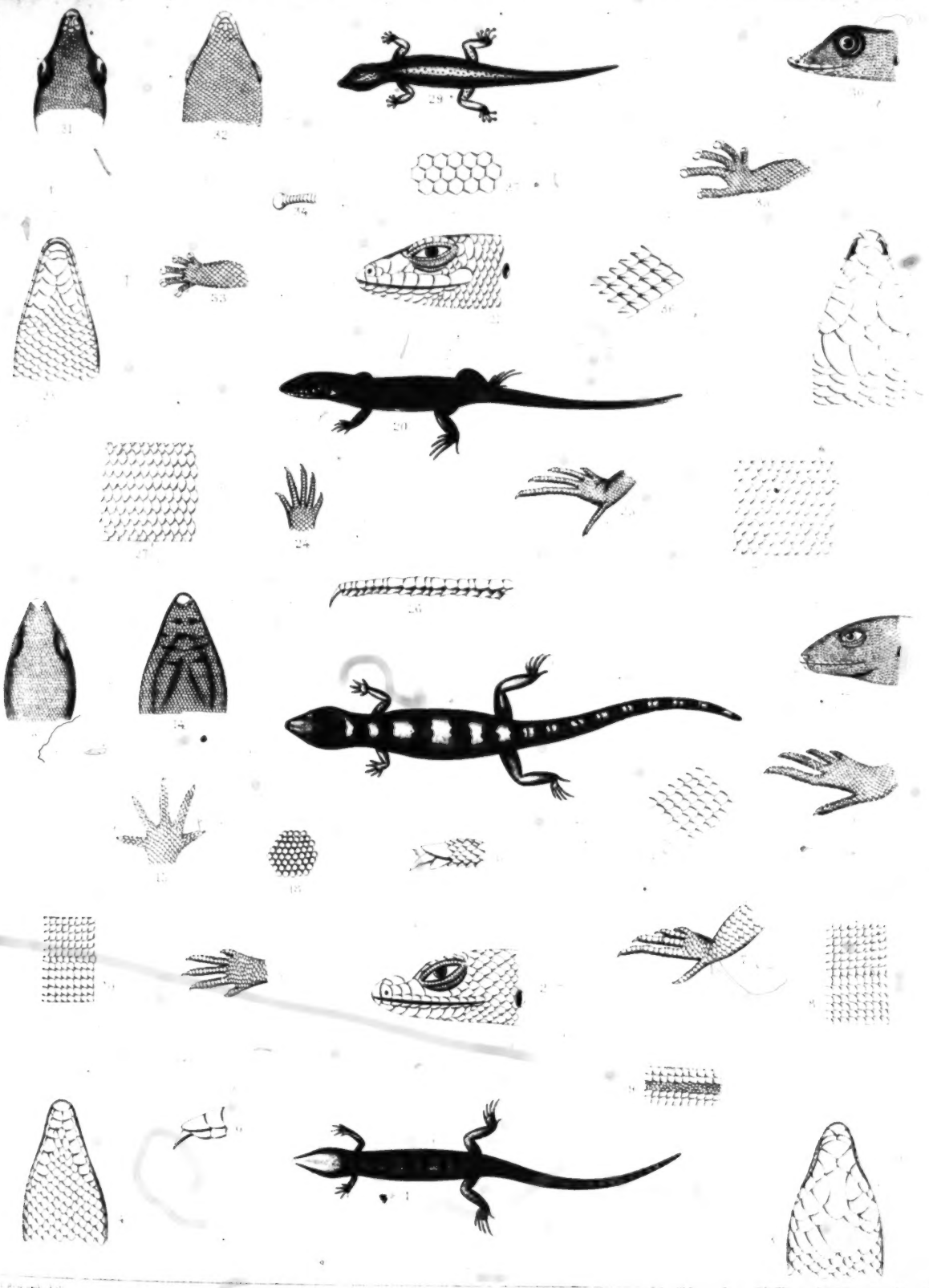

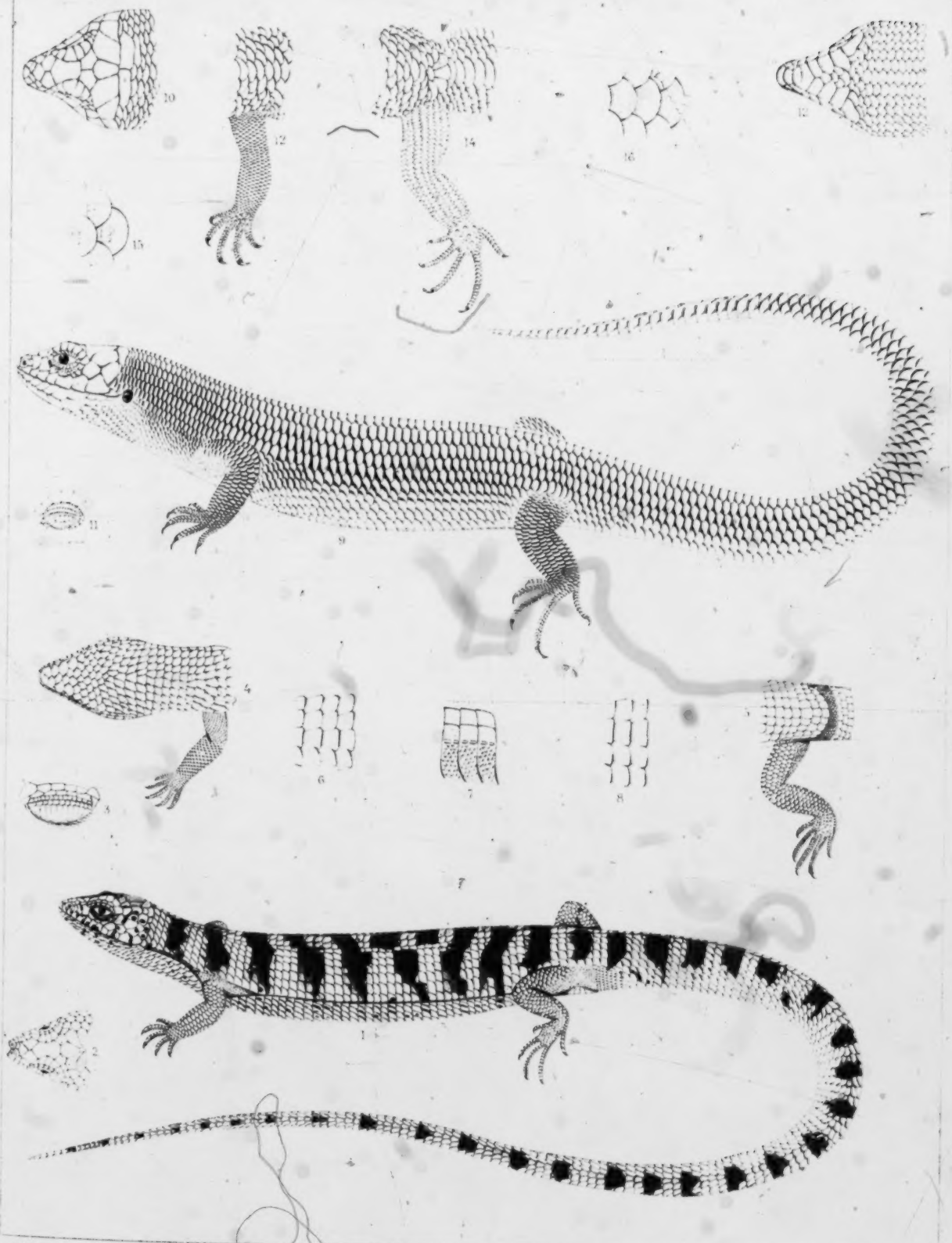

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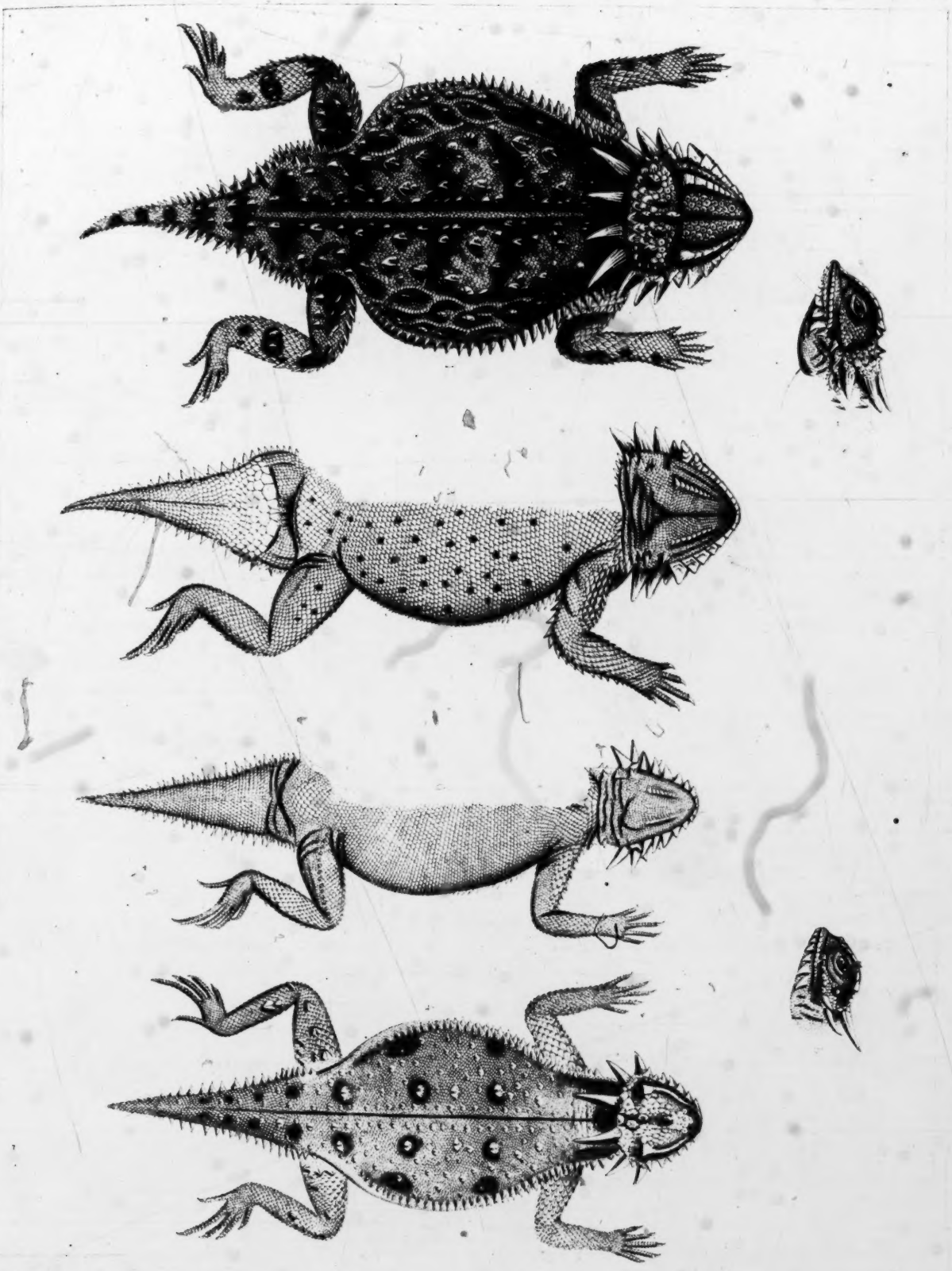

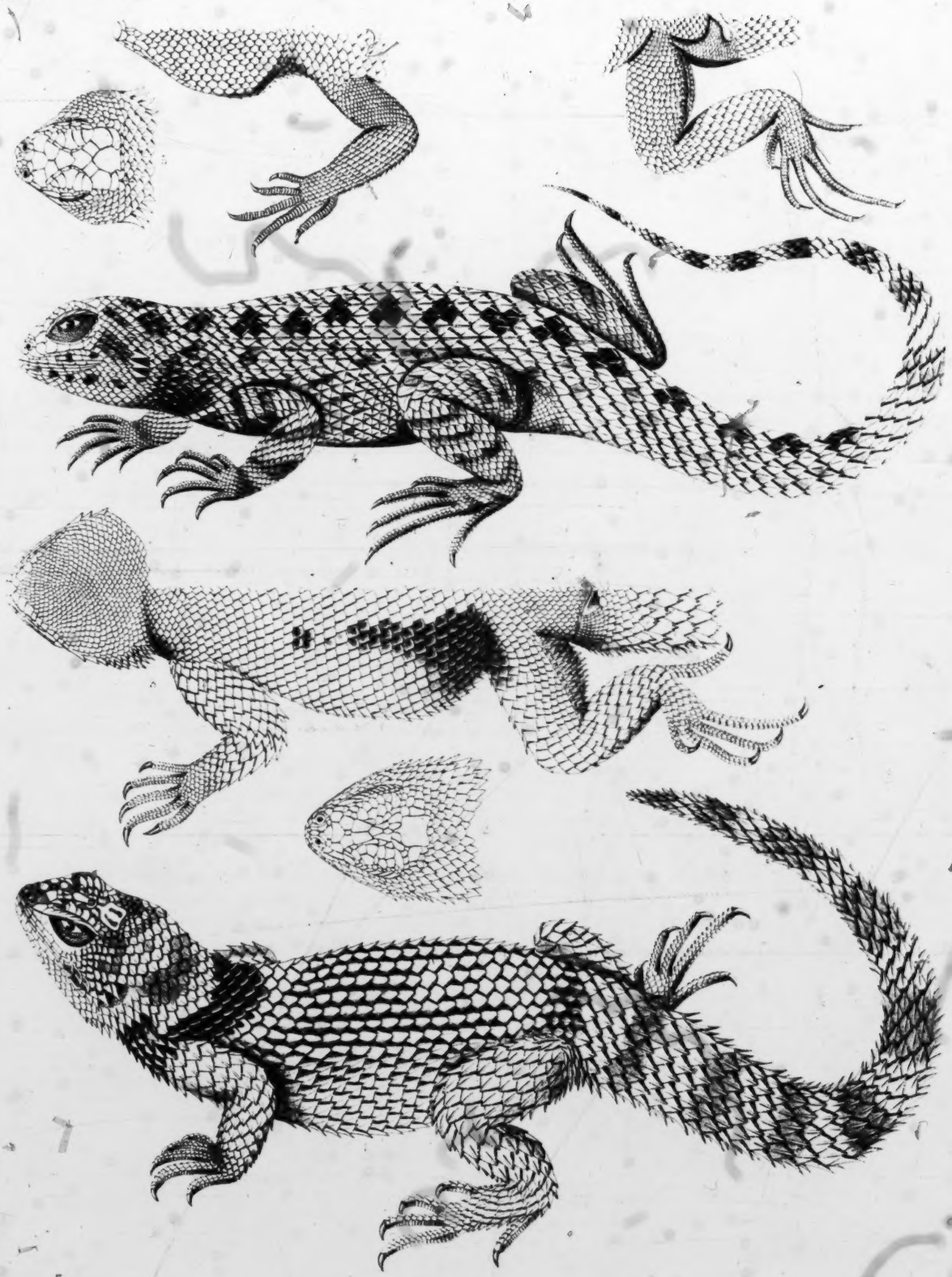

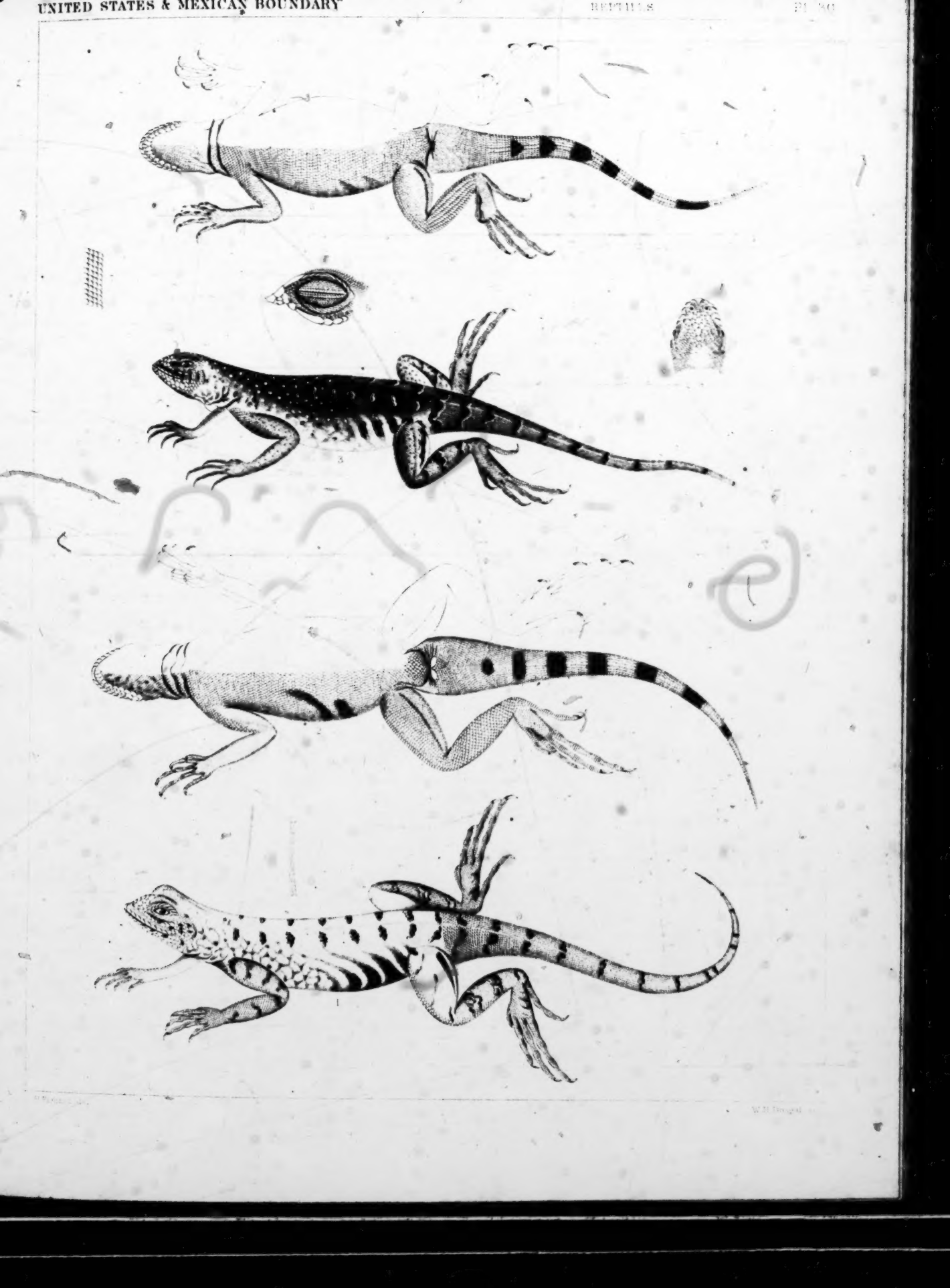

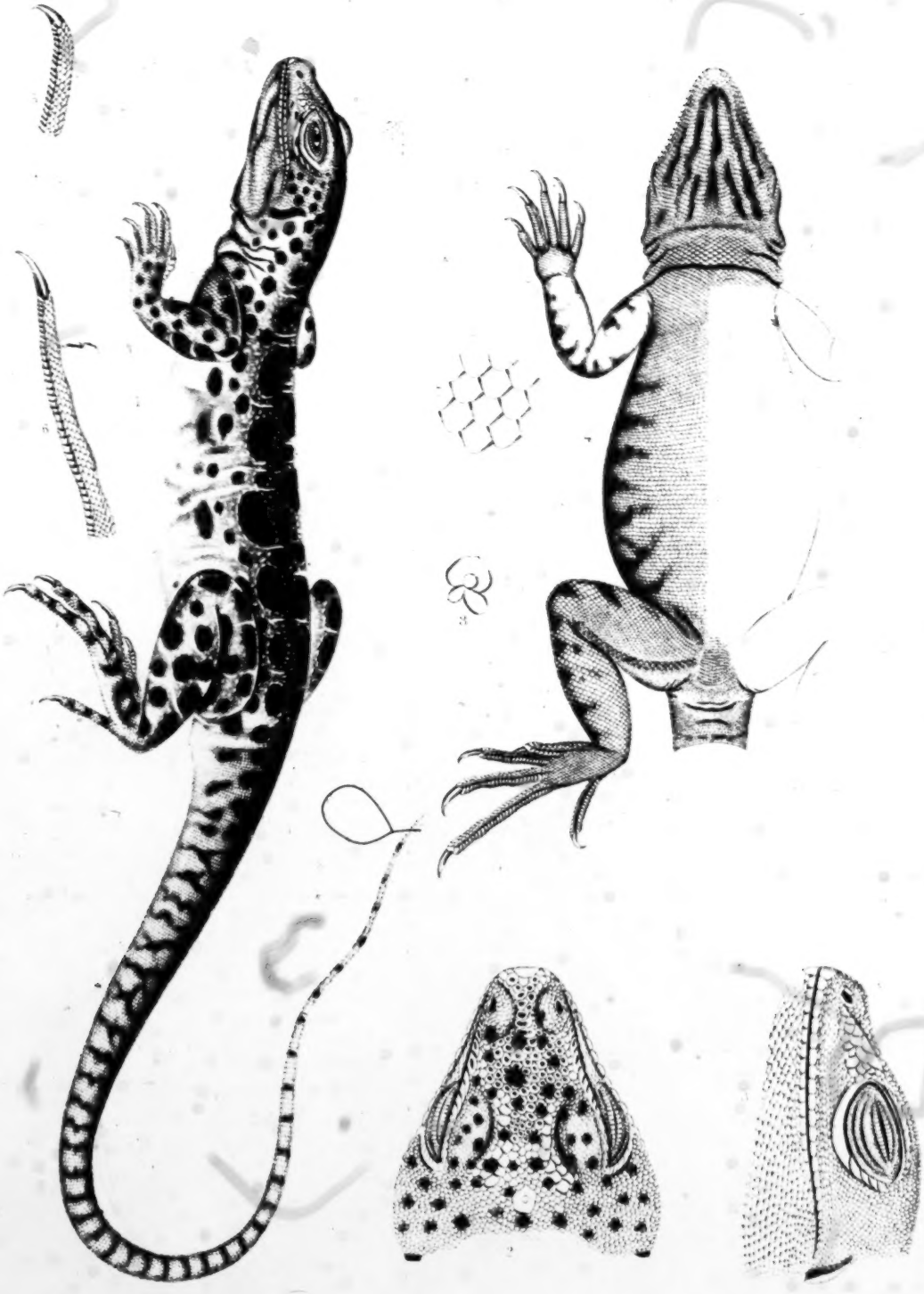

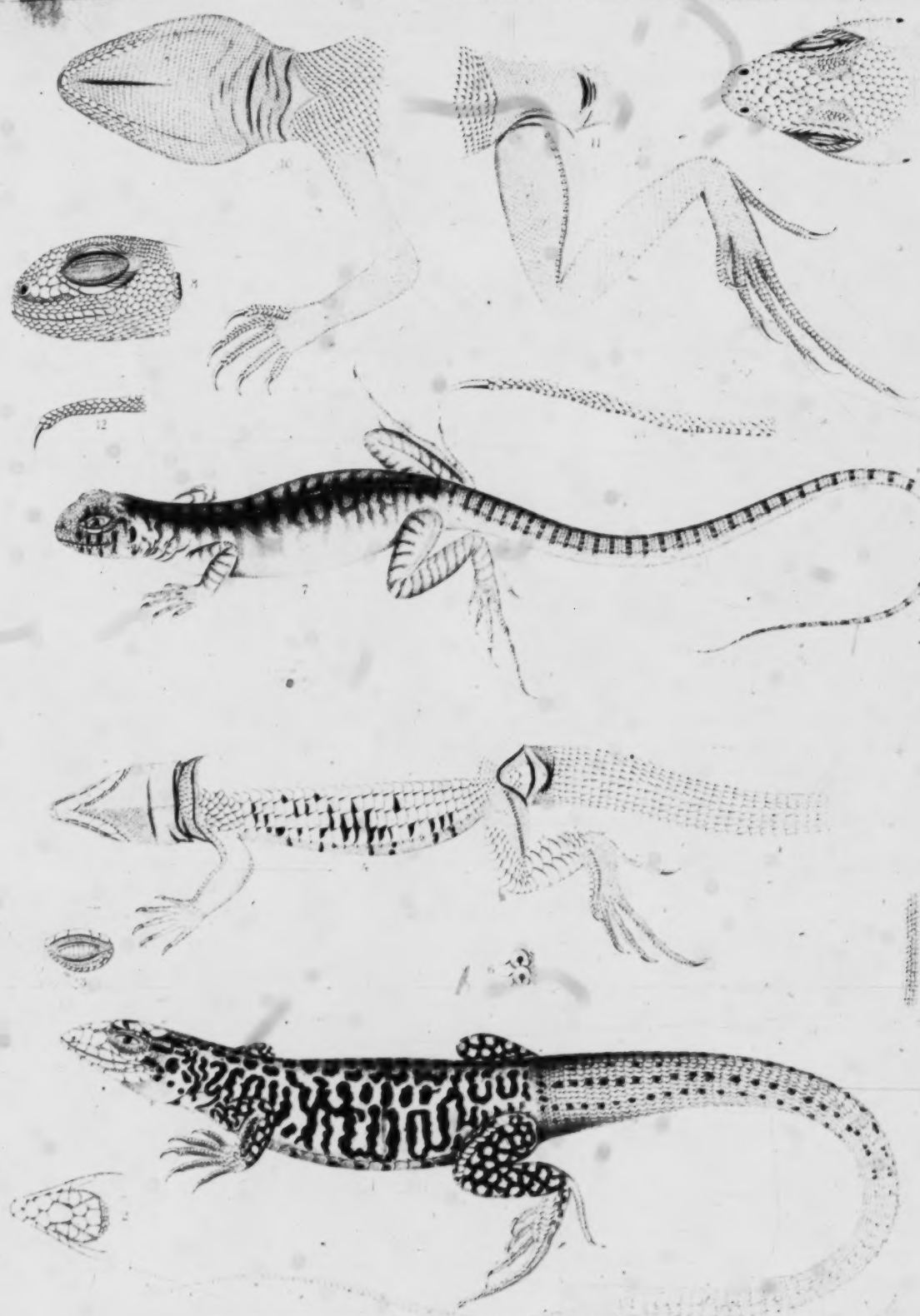

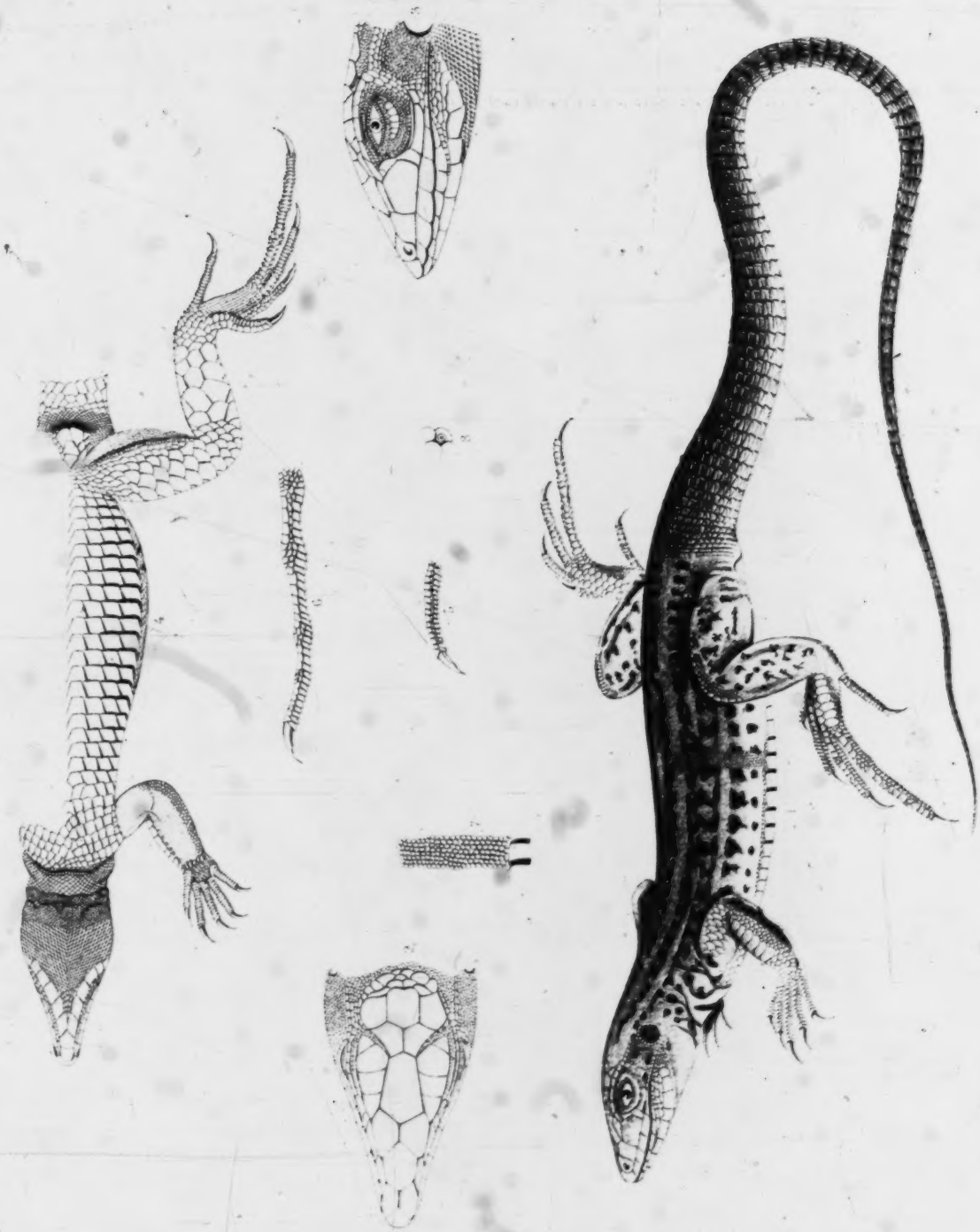

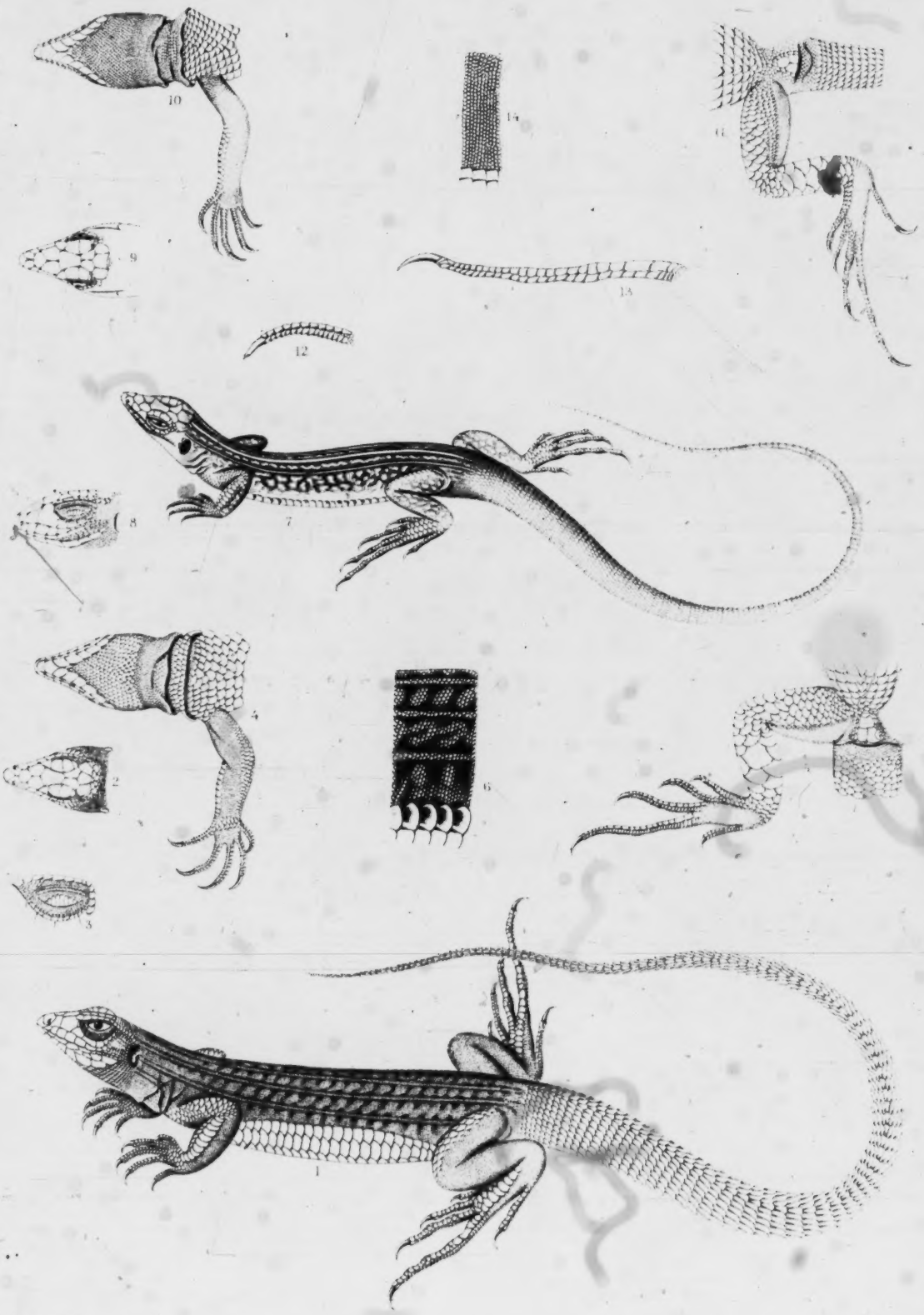
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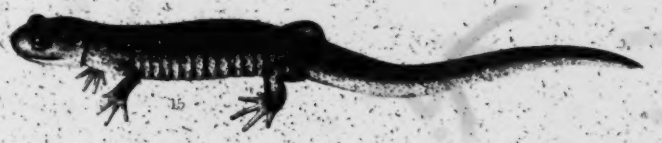

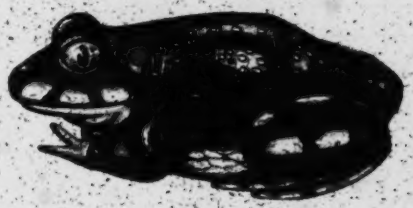

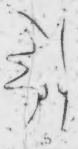

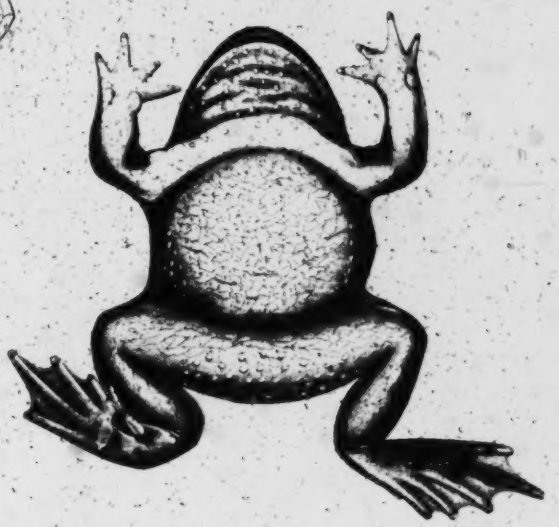

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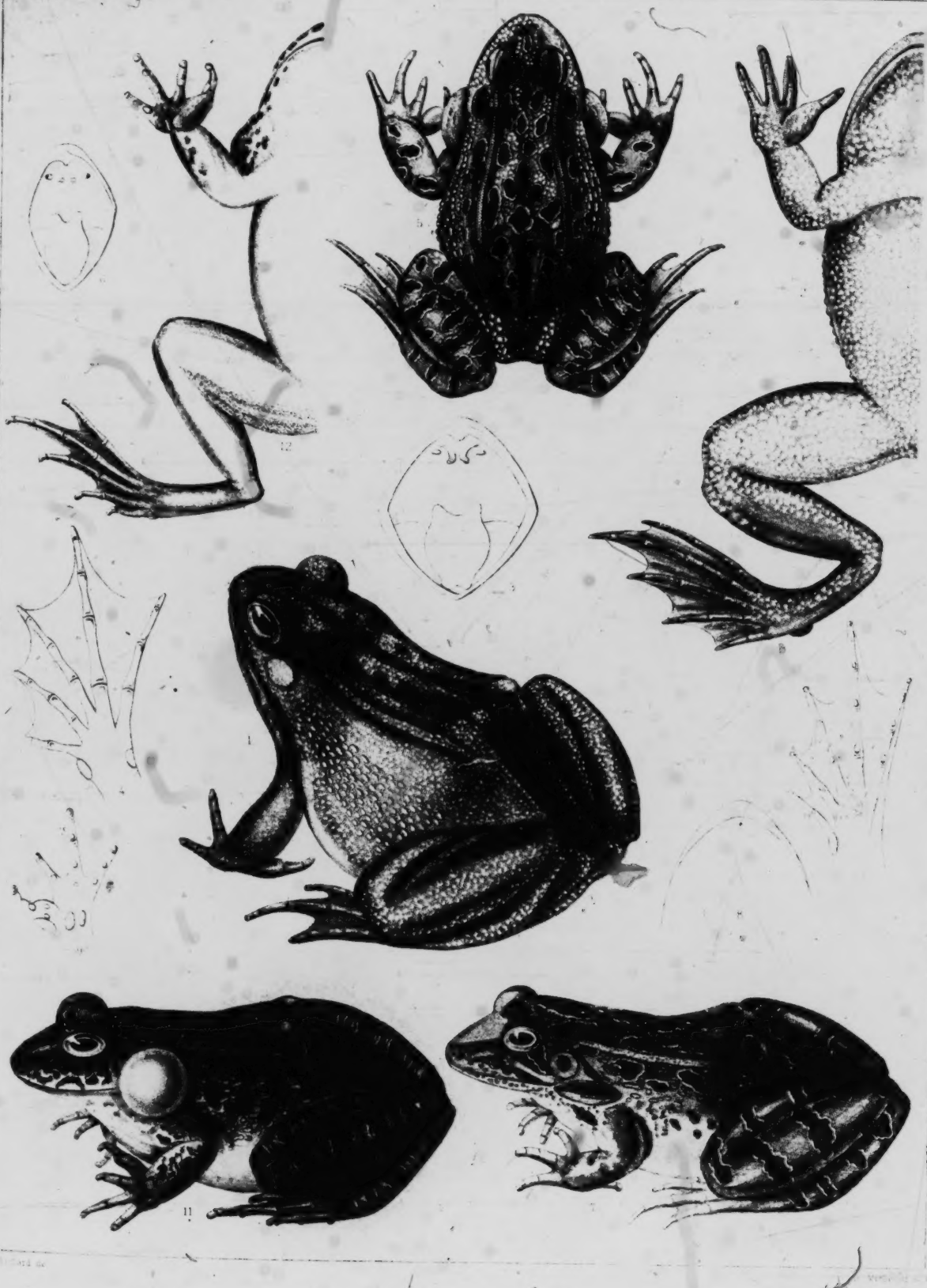
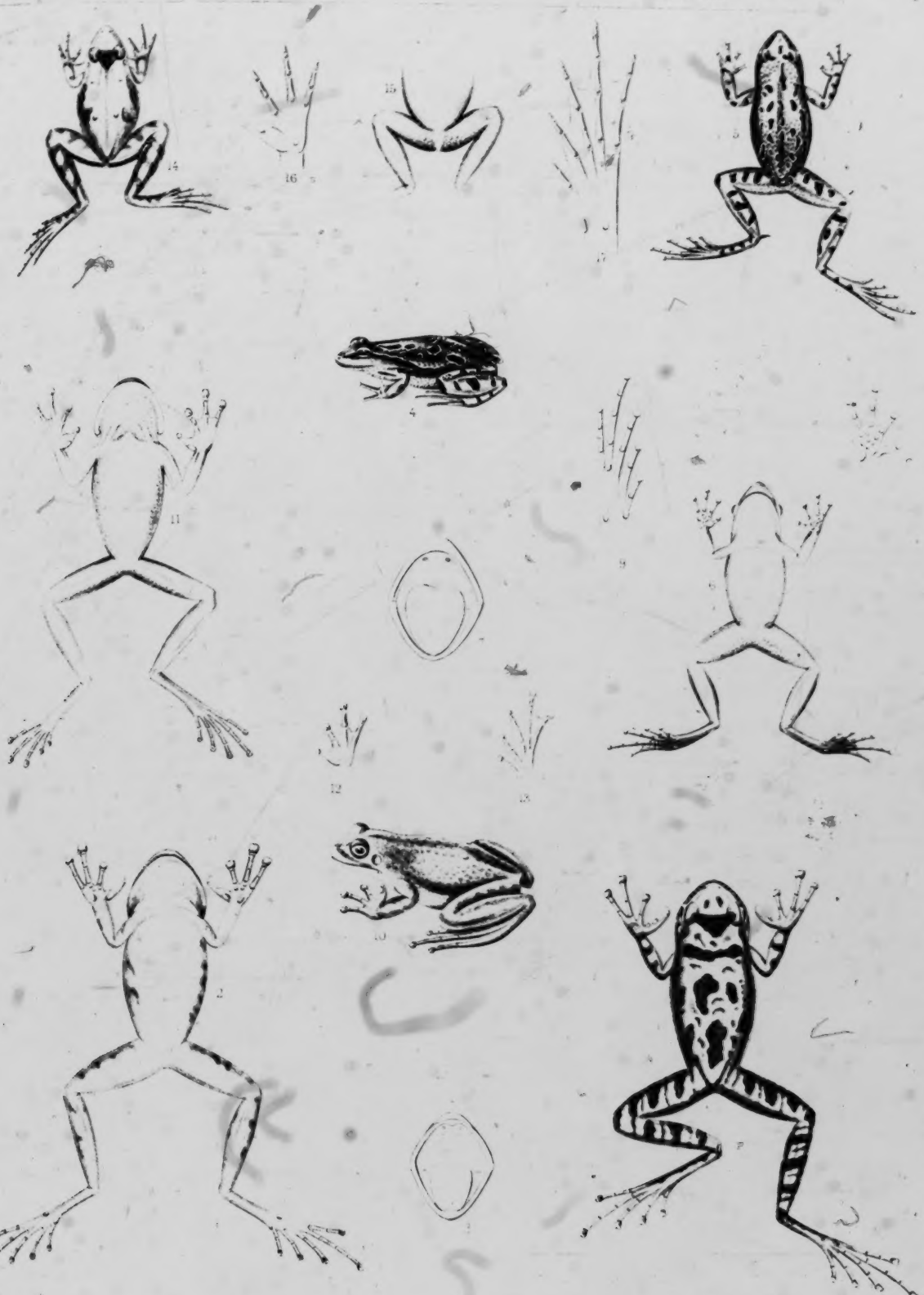
W. H. Dougal sc.





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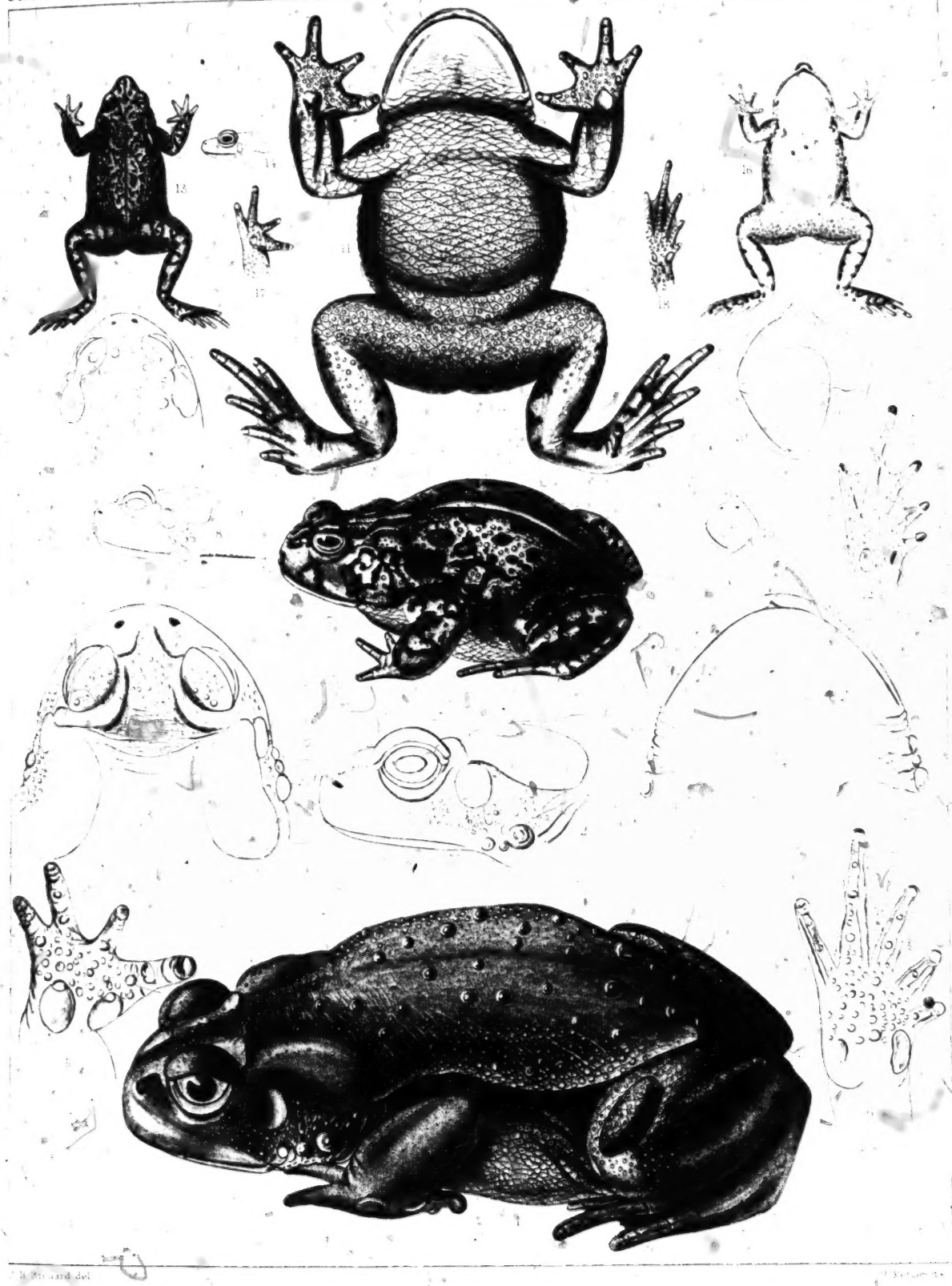

UNITED STATES AND MEXICAN

BOUNDARY SURVEY,

UNDER THE ORDER OF

LIEUT. COL. W. H. EMORY,

MAJOR FIRST CAVALRY, AND UNITED STATES COMMISSIONER.

ICHTHYOLOGY

OF THE BOUNDARY,

BY

CHARLES GIRARD, M. D.

ICHTHYOLOGY.

Family PERCIDAE.

DIOPLITES NUECENSIS, Grd.

Trout or River Bass.

PLATE I.

SPEC. CHAR.—Body elongated, sub-fusiform. Head constituting a little less than the third of the entire length. Posterior extremity of maxillary extending to a vertical line drawn posteriorly to the orbit. Scales on the cheeks nearly equal in size to those on the gill covers. Origin of ventrals placed posteriorly to the base of the pectorals. Upper regions reddish brown, maculated. A lateral dark band. Inferior regions whitish, unicolor.

SYN.—*Grystes nuecensis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 95.

This species is more closely related to *D. fasciatus* than to *D. salmoides*, and probably identical with *Grystes nobilis*, Agass. At any rate the latter has greater affinities with *D. fasciatus* than with *D. salmoides*, the latter being restricted to its proper limits.

The body is proportionally more elongated than in *D. fasciatus*, resembling more in that respect *D. salmoides*. It is compressed and sub-fusiform when seen in profile. The greatest depth is somewhat less than the fourth of the total length, in which the head enters a little less than three times. The mouth is more deeply cleft than in any other of the known species of the genus, and its gape is, as usual, oblique upwards, owing to the constant protrusion of the lower jaw beyond the upper, which it does very prominently in this species. The posterior extremity of the maxillary is very much dilated, extending to a vertical line drawn considerably back of the whole orbit. The tongue is large and stout at its base, thinning and tapering towards its apex, which is broadly rounded; it is smooth anteriorly, being provided posteriorly and upon its middle with a narrow band of velvet-like teeth. Both nostrils are nearer the anterior rim of the orbit than the extremity of the snout; the anterior one is a little smaller than the posterior, and placed more outwardly with reference to the middle line of the snout. The eye is of moderate development, sub-circular in shape, and reaching the summit of the cranium; its diameter enters about six times and a half in the length of the side of the head: twice in advance of the anterior rim of the orbit. The opercular apparatus is perfectly smooth and deprived of either spines or serratures. The scales upon the cheeks are but slightly smaller than those covering the opercular pieces. The gill openings are wide and continuous under the throat.

The base of the first or spiny dorsal is longer than that of the first, but the fin itself is lower and more arched in its outline. The first and second spines are shorter than the third, which is the highest, the remaining ones diminishing gradually posteriorly. The tenth spine, by its position, belongs rather to the second than the first dorsal. The second dorsal is higher than long, sub-trapezoid; its upper edge being but slightly convex, and the posterior rays almost as high as the anterior ones. The posterior margin of the caudal is sub-crescentic or sub-concave; the fin itself is contained five times and a half in the total length. The origin of the anal corresponds to a vertical line intersecting the anterior third of the second dorsal; its base extends a little further back than that of the latter, although the tips of the posterior rays of both fins are nearly even, the anal being not quite so deep as the second dorsal is high; its whole base, including the three small and slender spines at its anterior margin, is shorter than that of the second dorsal. The origin of the ventrals corresponds to a vertical line drawn immediately behind the base of the pectorals. The fins themselves are broad and short, since their posterior extremity does not reach the vent which is situated a little way in advance of the anterior margin of the anal fin, and under a vertical line drawn between the two dorsal fins. The pectorals are of moderate development, not extending quite as far back as the ventrals.

Br. VI: VI; D X, 13; A III, 11; C 4, 1, 8, 8, 1, 3; V I, 5; P 15. (Rio Cibolo.)

Br. VI: VI; D X, 13; A III, 12; C 4, 1, 9, 8, 1, 3; V I, 5; P 14. (Rio Blanco.)

The scales are of moderate development, sub-oblique, deeper than long, provided with radiating grooves upon their anterior section only, and pectinated posteriorly. The pectinations of the scales of the dorsal region are either obsolete or else deciduous, and easily removed with the epidermis. As a whole the fish has a rather smooth appearance, reminding us more of a trout than a perch were it not for its anterior spiny dorsal fin. From twenty-nine to thirty longitudinal rows of scales may be counted upon the line of greatest depth, nineteen below and nine above the lateral line. The scales under the throat are quite reduced in size; those on the cheeks being nearly as large as on the opercle. Minute scales may be observed upon the caudal fin to almost three-fourths of the length of its rays, and a few scattered ones upon the base of the second dorsal. The lateral line itself, from the upper region of the gill covers, is slightly arched upwards until under the second dorsal fin, hence runs nearly straightway along the middle of the peduncle of the tail to the base of the caudal fin.

The upper regions are reddish brown, of a more or less deep hue, and maculated with dark brown or black, whilst the inferior regions are whitish or yellowish, and unicolor. A lateral, more or less interrupted, dark band may be traced from the black patch at the posterior margin of the opercle, to the base of the caudal fin. Three obsolete streaks may be seen upon the cheeks diverging from the orbit. The fins are unicolor, except the second dorsal, which exhibits two longitudinal bars upon its base; the upper ones are greyish olive, the lower ones yellowish olive.

Plate I, fig. 1, represents *Dioplites nuecensis*, size of life; fig. 2, is a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig. No.	Nature of specimen.
388	1	Adult.	Rio Frio, Tex.	1851	Col. J. D. Graham		Alcoholic.
389	1		Rio Nueces, Tex.	1851	do		do
390	1		Live Oak creek, Tex.	1851	do		do
391	1		Turkey creek, Tex.	1851	do		do
392	6	Young.	Rio Leona, Tex.	1851	do		do
393	4	do	Elm creek, Tex.	1851	do		do
394	2		Texas	1851	do		do
395	5		San Juan river, N. Leon	1853	Lieut. D. N. Couch		do
503	1	Young.	Rio Sabinal, Texas	Nov., 1854	Maj. Emory	60	do
504	4	do	Dry creek, Tex.	Nov., 1854	do	55	do
505	1	do	San Pedro creek, Tex.	Nov., 1854	do	110	do
506	1	do	Minneville river, Tex.	Nov., 1854	do	52	do

CALLIURUS LONGULUS, Grd.

Plate IV, Figs. 1—4.

Spec. Char.—Mouth moderate; gape oblique upwards. Posterior extremity of maxillary extending to a vertical line intersecting the pupil. Eyes moderate. Insertion of ventrals situated opposite the inferior edge of the base of the pectorals, and posteriorly to the origin of the dorsal; their tips extending to the vent. Scales moderate. Reddish brown above; greyish beneath. Soft portion of dorsal and anal fins provided with a black patch.

Syn.—*Pomotis longulus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 391; and, in *Marcy's* Expl. Red river of La. 1853, 245, pl. xii.

Brythus longulus, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 25.

This species is described, illustrated, and compared to its congeners in the "Ichthyology of the U. S. P. R. R. Explorations and Surveys."

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig. No.	Nature of specimen.	Collected by—
405	2	Adult.	Rio Cibolo, Texas	1851	Col. J. D. Graham	6	Alcoholic.	John H. Clark
406	4	do	Minneville Rio, Texas	1854	Maj. Emory		do	Dr. C. B. Kennerly.

1. POMOTIS SPECIOSUS, B. & G.

Plate IV, Figs. 5—8.

Spec. Char.- Body sub-elliptical in profile. Head small; snout bluntly sub-conical. Mouth small; posterior extremity of maxillary extending to the anterior rim of the orbit. Inferior edge of preorbital and limb of preopercle finely serrated. Auricular flap small. Spinous portion of dorsal fin elevated. Anal spines well developed. Caudal emarginated. Reddish brown, lighter beneath. Young transversely banded. Fins greyish or yellowish; a black patch upon the dorsal.

Syn.—*Pomotis speciosus*, B. & G. in Proc. Ac d Nat. Sc. Philad. VII, 1854, 24.

The greatest depth is equal to half the length, the caudal fin excluded. The head constitutes less than the fourth of the total length, and the caudal fin about the fifth. The eye is subcircular, its diameter entering four times and a half in the length of the side of the head. The inferior edge of the preorbital is finely serrated, as well as the edge of the convexity of the preopercle. A vertical line drawn from the origin of the dorsal fin meets the insertion of the ventrals and passes behind the base of the pectorals. The tips of the ventrals overlap the vent and reach the origin of the anal. The extremities of the pectorals are nearly even with the tips of the ventrals. The posterior margin of the caudal is but slightly emarginated. The soft portion of the dorsal fin is nearly equal to that of the anal; the outline alone varying somewhat. The vent is situated opposite the eighth dorsal spine.

Br. VI: V; D X, 11; A III, 11; C 4, 1, 8, 7, 1, 3; V I, 5; P 12.

The scales are well developed, and, as usual, deeper than long, posteriorly ciliated or pectinated, and anteriorly furrowed. Fourteen longitudinal series may be counted upon the line of greatest depth below the lateral line, and six above it, making in all twenty-one series. The lateral itself is composed of from forty to forty-three scales.

The color is reddish brown, lighter beneath than above. The young exhibit numerous transverse bands of brown or black, which give way to a uniform tint as they grow older. The fins are yellowish or greyish and unicolor, except the dorsal, which is provided posteriorly with a large black patch. The anal and ventrals are, generally speaking, of a greyish hue.

Plate IV, fig. 5, represents *Pomotis speciosus*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig. No.	Nature of specimen.	Collected by—
432	3	Adult.	Brownsville, Texas	1852	Capt. Van Vliet	1 & 2	Alcoholic.	Capt. Van Vliet
434	24	Young	Devil's river, Texas	1854	Maj. Emory	63	..do..	Dr. C. B. Kennerly..
435	3	..do..	Cadereita, New Leon	1853	D. N. Couch	23	..do..	D. N. Couch
482	5	..do..	Brownsville, Texas	1852	Capt. Van Vliet		..do..	Capt. Van Vliet

2. POMOTIS HEROS, B. & G.

PLATE II, FIGS. 1—4.

SPEC. CHAR.—Head, mouth, and eye larger than in *P. speciosus*. Edge of preopercle inconspicuously serrated. Pectorals projecting beyond the tips of ventrals; anal fin provided occasionally with a black patch, as well as the dorsal.

SYN.—*Pomotis heros*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 25

With the general physiognomy of *P. speciosus*, this species differs, however, from the one just mentioned, by a proportionally larger head, hence a larger eye and a larger mouth. The posterior extremity of the maxillary extends a little beyond the anterior rim of the orbit. The edge of the preopercle is but inconspicuously if at all serrated, and the opercular flap of but moderate development.

The head constitutes about the fourth of the total length, and the diameter of the eye enters a little short of four times in the length of the side of the head. The nape is more or less convex, and the interocular region depressed. Five rows of scales may be counted upon the

cheeks beneath the eye. The pectoral fins are sub-lanceolated; their extremities extending beyond the tips of ventrals and the anterior margin of the anal fin. The ventrals themselves overlap the vent and reach the origin of the anal. The origin of the dorsal fin is opposite the base of the pectorals, and, consequently, situated in advance of the insertion of the ventrals. The scales are large and finely serrated upon their posterior margin. The radiating furrows of the anterior section are quite numerous. The posterior margin of the caudal is more deeply emarginated than in *P. speciosus*.

Br. VI: V; D X, 12; A III, 11; C 3, 1, 8, 7, 1, 2; V I, 5; P 13.

The scales are large and finely pectinated upon their posterior margin. They appear proportionally deeper than in *P. speciosus*. Small and polymorphic scales may be traced along the base of the caudal fin and soft portion of the dorsal and anal, as is the case also in *P. speciosus* and most species of the genus.

The color is reddish brown, sometimes blackish brown. The auricular flap is provided with a light postero-inferior margin. The tint upon the sides of the head is uniform with that of the sides of the body. The dorsal is provided posteriorly with a dark patch or blotch. A black patch may occasionally be observed at the posterior margin of the anal fin also. The young are unicolor.

Plate II, fig. 1, represents *Pomotis heros*, size of life; fig. 2 is a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig. No.	Nature of specimen.	Collected by—
438	4	Adult.	Rio Cibolo, Texas.....	1851	Col. J. D. Graham.....	.....	Alcoholic.	Jno. H. Clark.....
440	8	Young	Dry creek, near Victoria, Texa	1854	Maj. Emory.....	54	....do....	Dr. C. B. Kennerly.
441	1	..do..	.....do.....	1854	.....do.....	56	....do....	.....do.....
442	7	..do..	.....do.....	1854	.....do.....	53	....do....	.....do.....
443	12	..do..	Rio San Juan and near Cadereita, N. L.	1852	D. N. Couch.....	15&19	....do....	D. N. Couch.....

3. POMOTIS AQUILENSIS, B. & G.

Plate III, Figs. 1—8.

Spec. Char.—Body sub-elliptical in profile. Head moderate; snout bluntly sub-conical. Mouth moderate; posterior extremity of maxillary extending to a line intersecting the anterior rim of the orbit. Eye moderate. Edge of preopercle slightly denticulated or serrated. Auricular flap elongated and well developed. Spinous portion of dorsal fin elevated or else of medium height. Anal spines well developed. Extremities of pectorals not extending as far back as those of the ventrals which overlap the vent and reach the anterior margin of the anal fin. Reddish brown; fins greyish olive, unicolor; dorsal and anal provided with a black patch.

Syn.—*Pomotis aquilensis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 357.
Pomotis nefastus, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 24.

Resembles very much *P. speciosus* in general appearance, having sometimes, in common with the latter, the spinous portion of its dorsal fin quite elevated, it being then higher, or equal at the least, to the soft portion, which occupies the two-fifths of the base. Generally, however, it is of but moderate height. The caudal fin, which constitutes about the fifth of the total length, is more emarginated posteriorly than in *P. speciosus*.

The body, when viewed in profile, is more elliptical, more elongated proportionally, than in *P. speciosus*. The head constitutes rather more than the third of the length, the caudal fin being excluded. The eye is of medium size and sub-circular; its diameter entering three times and a half in the length of the side of the head, less than once in advance of its anterior rim. The scales on the cheeks are more numerous than in *P. speciosus*, and a good deal smaller than on the opercle. The mouth is larger than in the latter mentioned species; the posterior extremity of the maxillary extending to a vertical line intersecting the anterior rim of the orbit. The opercular flap is elongated, sometimes considerably developed, being prolonged posteriorly and inclining downwards without tapering. This feature is quite peculiar to this species.

The ventrals and pectorals are elongated, the latter not extending quite as far back as the former, which, however, overlap the vent and reach the origin of the anal fin.

Br. VI: VI; D X or XI, 11; A III, 10; C 4, 1, 8, 7, 1, 3; V I, 5; P 14.

The scales in the first variety (figs. 6—8) are as deep as long upon their posterior margin, which is sub-truncated; they are narrower posteriorly and rounded. In the second variety (figs. 2—4) they do not taper off posteriorly. The radiating furrows and the pectinations are numerous, each upon their respective section.

The ground color, as preserved in alcohol, is uniform reddish brown; the base of the ventrals, anal, and dorsal exhibiting a large, sometimes diffused, black patch.

This is as polymorphic a species as *P. fallax*; two of its extreme forms are represented on plate III; fig. 5 being the one first described as *P. aquilensis*, and fig. 1 as *P. nefastus*. They are both figured size of life.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected	Whence obtained.	Orig. N	Nature of specimen.	Collected by—
446	1	Young.	Eagle Pass	1853	Maj. Emory		Alcoholic.	A. Schott
447	1	...do...	San Felipe, Texas	1851	Col. J. D. Graham		...do...	Jno. H. Clark
448	5	Adult.	Rio Cibolo, Texas	1851	...do...		...do...	...do...
449	10	Young.	Rio Nueces, Texas	1851	...do...		...do...	...do...
450	24	...do...	Rio Sabinal, Texas	1854	Ma . Emory	62	...do...	Dr. C. B. Kennerly .
451	12	...do...	...do...	1854	...do...	61	...do...	...do...

4. POMOTIS FALLAX, B. & G.

PLATE II, FIGS. 5—8, & PLATE III, FIGS. 9—12.

SPEC. CHAR.—Body sub-circular or sub-elliptical; head moderate; snout bluntly sub-conical. Mouth large; posterior extremity of maxillary extending to the anterior rim of the pupil. Eye moderate. Edge of preopercle not crenated. Auricular flap very large. Spinous portion of dorsal of medium height, its origin situated opposite the base of the pectorals: caudal emarginated posteriorly. Blackish or reddish brown, lighter beneath than above. Sides of head with bluish spots, sometimes confluent into irregular lines. A black spot upon the base of the dorsal fin.

SYN.—*Pomotis fallax*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 24.

Pomotis convexifrons, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 24.

A comparative study of a larger number of specimens than we had heretofore has satisfied us that *P. convexifrons* was identical with *P. fallax*. The latter appears to be one of the most

polymorphic species of the genus, and we have deemed it expedient to give figures and outlines of the most prominent forms on Plate X, of the U. S. R. R. Expl. and Surveys, as a more sure guide to future researches.

It is, therefore, difficult to take into account the form of the body in a specific point of view. Generally speaking, however, it is sub-circular or sub-elliptical; the head being of but moderate development compared to the other species, constituting the third of the length, the caudal fin excluded. The snout is bluntly sub-conical. The mouth itself is proportionally large, obliquely directed upwards. The posterior extremity of the maxillary extends to a vertical line intersecting the anterior rim of the pupil. The eye is of moderate development, circular in form; its diameter entering about four times in the length of the side of the head, or else a little less. The edge of the preopercle is not crenated. The opercular appendage, on the other hand, is very large when fully developed, reaching even abnormal proportions. The origin of the dorsal fin is situated opposite the upper edge of the base of the pectoral fins; its spinous portion is of medium height, with its outline more or less arched, it being subjected to some variations; it is always lower than the soft portion. The caudal is moderately emarginated posteriorly. The tip of the ventrals overlap the vent and reach the anterior margin of the anal. The external soft ray becomes filamentous in the adult and then projects beyond the anterior margin of the latter mentioned fin. The pectorals are rather broad, and their extremity does not extend as far back as the tip of the ventrals. The posterior extremities of both dorsal and anal fins fall evenly with the same vertical line.

D X, 11; A III, 9; C 3, 1, 8, 7, 1, 2; V I, 5; P 14. (Elm creek.)
X, 11; III, 9; 3, 1, 8, 7, 1, 2; I, 5; 13. (Rio Cibolo.—*P. convexifrons.*)

The scales are of moderate development, sub-hemispherical, rounded posteriorly, superiorly, and inferiorly, and truncated or sub-truncated anteriorly; always deeper than long. The pectinations are often carried away with the epidermis.

The color is either blackish or reddish brown, lighter beneath than above. The sides of the head exhibit bluish spots, which are sometimes confluent into irregular lines. The opercular flap is margined by a narrow light filet, whilst a black spot is occasionally observed upon the base of the soft portion of the dorsal fin posteriorly.

Plate II, fig. 5, represents *Pomotis fallax*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; and fig. 8, a scale from the abdominal region.

Plate III, fig. 9, represents, size of life, the variety which we have formerly described as a species under the name of *Pomotis convexifrons;* fig. 10 is a scale from the dorsal region; fig. 11, a scale from the lateral line; and fig. 12, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig'l No.	Nature of specimen.	Collected by—
457	2	Adult.	Rio Cibolo, Texas.....	1851	Col. J. D. Graham...	.....	Alcoholic.	Jno. H. Clark.....
458	1	..do..	Elm Creek, Texas.....	1851	.....do.....	.....	....do....	.....do.....
459	5	Young	Rio Salado, Texas.....	1851	.....do.....	.....	....do....	.....do.....
460	6	..do..	Live Oak creek, Texas..	1854	Major Emory.....	64	....do....	Dr. C. B. Kennerly....
461	5	..do..	San Pedro creek, Texas..	1854	.....do.....	59	....do....	.....do.....

Amongst other fresh water percoids collected by the Commission we have further to mention *Calliurus melanops*, Grd., as having been collected in 1854 by Dr. Kennerly, in the Dry creek Texas, and in San Pedro creek, Texas.

Of the marine tribe of the same family specimens of *Centropomus undecimalis*, Cuv. & Val., were collected by Jno. H. Clark, near the mouth of the Rio Grande del Norte (Rio Bravo).

Family ETHEOSTOMIDAE.

Exclusively limited to the fresh waters of the northern portion of the western hemisphere, the fishes of this family have not yet been made the subject of any researches beyond the establishment of some genera and the naming of sundry species. Their intimate structure, by which alone their natural affinities can be traced, is left for future investigations, which we hope, ere long, to be able to undertake. The materials on hand are already very numerous.

PILEOMA CARBONARIA, B. & G.

PLATE VIII, FIGS. 10—13.

SPEC. CHAR.—Body elongated, sub-fusiform, compressed; peduncle of the tail slightly contracted upon its middle. Head constitution about the fifth of the total length; snout sub-conical; posterior extremity of maxillary extending to a vertical line drawn in advance of the anterior rim of the orbit. The eye is well developed, sub-circular in shape, its diameter being contained four times and a half in the length of the side of the head. The anterior dorsal is longer than high, and approximates closely the second dorsal, which is somewhat higher than the first, and likewise longer than high. Two short spines may be observed at the anterior margin of the anal fin. The posterior margin of the caudal is sub-concave. The ventrals, inserted somewhat in advance of the anterior margin of the dorsal, are sub-lanceolated and their extremities extend further back than those of the pectorals. The pectorals themselves are rather broad and sub-elliptical.

SYN.—*Pileoma carbonaria*, B. & G in Proc. Acad. Nat. Sc. Philad. VI, 1853, 387.

The scales are nearly as long as deep, anteriorly sub-truncated with radiating furrows, whilst their posterior edge is rounded and provided with largely developed spines or pectinations.

Br. VI: VI; D XV, 13; A II, 9; C 3, 1, 8, 7, 1, 2; V I, 5; P 13.

The ground color is reddish yellow with transverse bars of black. A black spot may be seen at the base of the caudal, which is barred. The base of the dorsals, the anal, and the ventrals, is black also. The pectorals being unicolor.

Plate VIII, fig. 10, represents *Pileoma carbonaria*, size of life; fig. 11 is a scale from the dorsal region; fig. 12, a scale from the lateral line; and, fig. 13, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
740	7	Adult.	Rio Salado, Texas.....	1851	Col. J. D. Graham ...	Alcoholic.	Jno. H. Clark .....
741	1	...do ..	Rio Medina, Texas.....	1851	.....do.....	....do.....	.....do.....
742	1	...do...	San Pedro creek, Texas..	1854	Major Emory.....	....do....	Dr. C. B. Kennerly....

POECILICHTHYS LEPIDUS, Grd.

PLATE VIII, FIGS. 14—17.

SPEC. CHAR.—Body compressed, rather thick upon its middle region, and attenuated towards both extremities. The head is subconical, forming about the fourth of the entire length. The jaws are equal; the mouth being moderate, the posterior extremity of the maxillary reaching a vertical line intersecting the anterior rim of the orbit. The eye is large and circular, its diameter entering about four times in the length of the side of the head. The first dorsal fin is quite low and longer than the second. The ventrals and the anal being rather small.

SYN.—*Boleosoma lepida*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 388.

The color is reddish brown with indistinct transverse blackish bands or bars; the base of the scales is black also. The dorsals and caudal are mottled or barred, whilst the remaining fins are unicolor. A vertically elongated spot may be observed beneath the eye.

D IX 11; A II, 6; C 3, 1, 6, 5, 1, 2; V I, 5; P 14.

Plate VIII, fig. 14, represents *Pœcilichthys lepidus*, size of life; fig. 15 is a front view of the open month, showing the maxillar teeth; fig. 16, an outline of the fish seen from above; and, fig. 17, a section of the body across the line of greatest depth.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
744	8	Adult.	Rio Leona, Texas.....	1851	Col. J. D. Graham...	Alcoholic	Jno. H. Clark.....

Family BATRACHIDAE.

Several specimens of toad fishes were collected at Indianola, Texas, in 1851, by John H. Clark, under Col. J. D. Graham. As far as a hasty examination of them would permit, we have identified the species with *Batrachus tau*, CUV. & VAL. Hist. nat. Poiss. XII, 1837, 478.

Family SCIAENIDAE.

The want of space forbids us working up descriptions of the following species of this family:

1. OTOLITHUS NOTHUS, Holbr.—Specimens collected at Brazos Santiago, Texas, by Lieutenant D. N. Couch.

2. LEIOSTOMUS OBLIQUUS, DeKay.—Specimens collected at Brazos Santiago, Texas, by G. Würdemann, and at Indianola, by John H. Clark, under Colonel J. D. Graham.

3. HOMOPRION LANCEOLATUS, Holbr.—Specimens collected at St. Joseph's Island, Texas, by G. Wiirdemann.

4. HOMOPRION XANTHURUS, Holbr.—Specimens collected at the Brazos, by John H. Clark, under Major Emory, and at St. Joseph's Island, by G. Würdemann.

5. CONODON ANTILLANUS, Cuv. & Val.—Specimens collected at Brazos Santiago, Texas, by G. Würdemann.

6. POGONIAS FASCIATUS, Lacép.—Specimens collected at Brazos Santiago, Texas, by G. Würdemann.

7. SARGUS OVIS, Cuv. & Val.—Specimens collected at Indianola, Texas, by John H. Clark, under Colonel Graham; at New Orleans, by Lieutenant Couch; at the Brazos, by John H. Clark, under Major Emory, and by G. Würdemann; also at Indianola, Texas, by Dr. C. B. Kennerly.

OTOLITHUS DRUMMONDI, Richards.

Drummond's Weak Fish.

PLATE VI.

SPEC. CHAR.—Head constituting the fourth of the entire length; the body being gracefully elongated and fusiform in its profile. The posterior extremity of the maxillary extends to a vertical line drawn across the posterior rim of the orbit. The eye is of medium size, sub-elliptical; its longitudinal diameter entering about seven times in the length of the side of the head. The posterior margin of the caudal is rounded in the young and sub-truncated in the adult, obscurely trilobed, arising from the fact that the central rays of that fin are somewhat longer than those of the middle of either lobe.

SYN.—*Otolithus drummondi*, RICHARDS. Frankl. Bor. Amer. III, 1836, 70.—DEKAY, N. Y. Faun. IV, 1842, 72.—STORER, Synops. 1846, 66.

The scales are of but moderate development, very finely pectinated upon their posterior section, and provided with diverging furrows upon their anterior section. The dorsal region is dark or greyish brown, with small, rounded, blackish brown spots above the lateral line and on the second dorsal and caudal; much more numerous in the young than in the old. The sides of the head and body, as well as the abdomen, exhibit a silvery tint. The anal fin is greyish; the pectorals and ventrals yellowish.

Br. VII: VII; D IX, I, 25; A I, 12; C 2, 1, 8, 7, 1, 3; V I, 5; P 16.

There are two canine teeth to the upper jaw in the majority of the specimens which we have examined, and we are satisfied that when one only is observed the other was accidentally broken.

Plate VI, fig. 1, represents *Otolithus drummondi*, reduced in size from a specimen nearly fifteen inches in total length; fig 2 is a scale from the dorsal region; fig. 3, a scale from the lateral line; and fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When col'td.	Whence obtained.	Nature of specimen.	Collected by—
614	1	Adult.	Indianola, Texas	1851	Col. J. D. Graham	Alcoholic.	John H. Clark.
615	1	.....	do.	1853	Major Emory	do.	do.
616	1	.....	Brazos	1854	do.	do.	Dr. C. B. Kennerly.
617	2	Young	Brazos Santiago	1853	G. Würdemann	do.	G. Würdemann.
618	1	Adult.	New Orleans, La	1853	D. N. Couch	do.	D. N. Couch

AMBLODON NEGLECTUS, Grd.

PLATE V, FIGS. 6—10.

SPEC. CHAR.—Profile of the head sloping evenly from the occiput to the snout, which is sub-conical and rounded. Posterior extremity of maxilla bone extending to a vertical line which would intersect the middle of the pupil. Extremities of ventral fins projecting somewhat beyond those of the pectorals and reaching the vent. Second anal spine very stout. Caudal fin posteriorly convex. Upper regions reddish brown; sides and belly silvery. Fins unicolor. Dorsals and caudal greyish olive; anal, ventrals, and pectorals yellowish.

This species differs from *A. grunniens*, its nearest relative, by a more pointed and conical snout, a larger mouth, and a somewhat larger eye. The first anal spine is stouter, and the second spine of the same fin both stouter and longer. The even profile of the upper surface of the head contributes to a great extent in giving it its peculiar physiognomy, which, when once compared to that of *A. grunniens*, is never to be mistaken. The second dorsal is not quite so high as in the latter mentioned species, and composed of but thirty rays. The other fins exhibit no material differences in the number of their soft rays. We observe but six branchiostegal rays.

Br. VI: VI; D X, 30; A II, 8; C 3, 1, 7, 7, 1, 2; V I, 5; P 16.

In the absence of authentic specimens of *A. concinnus*, Ag., and *A. lineatus*, Ag., we are not prepared to point out the affinities of these species with the one here referred to.

Plate V, fig. 6, represents *Amblodon neglectus*, size of life; fig. 7 is the head seen from beneath; fig. 8, a scale from the dorsal region; fig. 9, a scale from the lateral line; and, fig. 10, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
636	1	Mouth of Rio Grande del Norte (Rio Bravo).	1853	Major Emery.....	Alcoholic.	John H. Clark.....
637	24	Matamoras (Tamaulipas)...	1853	D. N. Couch .....do....		L. Berlandier .....

UMBRINA PHALAENA, Grd.

Plate V, Figs. 1—5.

Spec. Char.—Head contained a little less than four times in the total length, pre-opercular spines inconspicuous. Posterior extremity of maxillary corresponding to a vertical line drawn across the anterior rim of the pupil. Outer row of pre-maxillar teeth very conspicuous. Longitudinal diameter of the eye entering six times and a half in the length of the side of the head: twice in advance of the anterior rim of the orbit. Origin of ventral fins opposite the third dorsal spine. Origin of anal situated under the eighth articulated ray of the second dorsal. Caudal fin slightly concave posteriorly, constituting about the sixth of the total length.

The last anal ray being bifurcated from its very base, otherwise there would be but seven soft rays to that fin. The scales are much deeper than long, finely pectinated upon their posterior section, and exhibiting radiating furrows upon their anterior section alone.

Br. VII: VII; D X, I, 23; A I, 8; C 4, 1, 8, 7, 1, 3; V I, 5; P 1, 21.

Upper regions greyish brown, obscurely clouded; inferior regions of a dirty white hue, with minute black specks. Fins olivaceous; pectorals, anal, and caudal speckled; dorsals and ventrals unicolor, except the first dorsal, which is blackish upon its upper margin.

Plate V, fig. 1, represents *Umbrina phalaena*, size of life; fig. 2 is the head viewed from beneath, showing the outline of the mouth; fig. 3, a scale from the dorsal region; fig. 4, a scale from the lateral line; and fig. 5, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
619	1	Adult.	Indianola, Texas.....	1851	Col. J. D. Graham ..	Alcoholic.	John H. Clark.....
620	4	Young	Brazos Santiago	1853	G. Würdemann	....do....	G. Würdemann .....

MICROPOGON UNDULATUS, Cuv. & Val.

Grunter and Croaker.

Plate VII.

Spec. Char.—The greatest depth under the first dorsal fin is a little less than the fourth of the total length, in which the head enters three and three-quarters of a time. The posterior extremity of the maxillary is even with a vertical line drawn in advance of the pupil. The eye is sub-elliptical; its longitudinal diameter entering about five times in the length of the side of the head. The caudal fin constitutes the fifth of the total length, in which the base of the anal enters twelve times. The base of the first dorsal is a little more than the half of that of the second dorsal.

SYN.—*Perca undulata*, LINN. Syst. Nat. I, 483; &, ed. XIIIa, *Gmelini*, I, III, 1788, 1312.
Micropogon undulatus, CUV. & VAL. Hist. nat. Poiss. V, 1830, 219.—DEKAY, New Y. Fauna IV, 1842, 84.—STORER, Synops. 1846, 73.—HOLBR. Ichth. of South Ca. 1855, 145; pl. xxi, fig. 1.

A vertical line dropped from the origin of the first dorsal intersects the posterior edge of the opercle, and hence passes in advance of the base of the pectoral fins. The latter are more elongated than the ventrals.

Br. VII: VII; D X, I, 29; A II, 8; C 5, 1 8, 7, 1, 4; V I, 5; P 17.

The ground color is silvery, greyish along the dorsal region, with oblique blackish bands extending somewhat beyond the lateral line, whilst the sides of the head, the remaining portion of the flanks and the belly, are of a brilliant lustre. The second dorsal exhibits one or two longitudinal series of dark spots between the rays. The dorsal bands themselves are the result of series of spots.

Plate VII, fig. 1, represents *Micropogon undulatus*, size of life; fig. 2, the head from beneath to show the mouth; fig. 3 is a scale from the dorsal region; fig. 4, a scale from the lateral line; and fig. 5, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
626	1	Adult.	Mouth of Rio Grande el Norte (Rio Bravo).	1853	Major Emory.....	Alcoholic.	Jno. H. Clark....
627	1	.....	Indianola, Texas.....	1854	.....do.....	.....do....	Dr. C.B. Kennarly
628	1	.....	Galveston, Texas.....	1853	Lieut. Whipple...	....do....	.....do.....
629	1	.....	St. Joseph's Island, Texas.....	1853	G. Würdemann...	....do....	G. Würdemann...

JOHNIUS OCELLATUS, Grd.

Spotted Bass.

PLATE VIII, FIGS. 1—4.

SPEC. CHAR.—The head constitutes about the fourth of the length, in which the caudal fin itself enters nearly six times. The greatest depth, under the anterior margin of the first dorsal fin, is contained four times and a half in the length. The mouth is large; its gape nearly horizontal; the posterior extremity of the maxillary extending to a vertical line drawn across the posterior rim of the orbit. The eye is sub-circular; its horizontal diameter entering six times and a half in the length of the side of the head. A vertical line dropped from the origin of the first dorsal passes immediately behind the base of the pectorals and intersects the base of the first soft ray of the ventrals.

SYN.—*Perca ocellata*, LINN. Syst. Nat. I, 483; &, ed. XIIIa, I, iii, 1788, 1313.—SHAW, Gen. Zool. IV, 1800, 550.
Sciæna imberbis, MITCH. in Trans. Lit. and Philos. Soc. New Y. I, 1815, 411.
Corvina ocellata, CUV. & VAL. Hist. nat. Poiss. V, 1830, 134; pl. cviii.—DEKAY, N. Y. Fauna IV, 1842, 75; pl. xxi, fig. 6.—STORER, Synops. 1846, 67.—HOLBR. Ichth. of South Ca. 1855, 149; pl. xxi, fig. 2.

The pectorals are nearly equal to the ventrals in length. The base of the anal fin is contained about eleven times in the total length; its exterior margin is slightly concave. The base of the second dorsal is twice that of the first.

Br. VII: VII; D X, I, 25; A II, 8; C 3, 1, 8, 7, 1, 2; V I, 5; P 17.

The color is silvery; the dorsal region bluish or greyish; the lower part of the flanks and abdomen lighter; a jet black spot at the base of the upper lobe of the caudal fin.

Plate VIII, fig. 1, represents *Johnius ocellatus*, somewhat reduced in size; fig. 2 is a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
622	1	Adult..	Indianola, Texas.....	1851	Col. J. D. Graham....	Alcoholic.	Jno. H. Clark.....
623	5	Young.	.....do.....	1853	Lt. A. W. Whipple....	....do....	Dr. C. B. Kennerly....

ORTHOPRISTIS, Girard.

Gen. Char.—The mouth is small; the upper and lower jaws are provided with small, conical teeth. The edge of the preopercle is nearly straight and finely serrated. The spinous portion of the dorsal is continuous with the soft portion, constituting one uninterrupted fin. Three small spiny rays at the anterior margin of the anal, increasing in size from the first to the third.

The natural affinities of this genus are between *Haemulon* and *Pristipoma*.

ORTHOPRISTIS DUPLEX, Grd.

Plate IX, Figs. 1—4.

Spec. Char.—Body somewhat elongated, sub-fusiform in its outline. Head constituting the fourth of the total length; snout sub-conical; mouth small and slightly protractile, with its gape somewhat oblique; posterior extremity of maxillary even with a vertical line drawn immediately in advance of the anterior nasal aperture. The eye is sub-elliptical, of medium size; its horizontal diameter entering about four times and a half in the length of the side of the head. The spines at the edge of the preopercle are very small, short, and acute. The origin of the dorsal fin is situated opposite the branchial apertures, hence in advance of the base of the pectorals; its posterior rays extending somewhat further backwards than those of the anal, without, however, reaching the insertion of the caudal fin. The extremities of the pectorals extend nearly as far as the tips of the ventrals, which barely reach the vent.

The scales are deeper than long; their posterior section is conspicuously pectinated, whilst the anterior section exhibits the usual radiating furrows; the lines of growth being concentrical. The base of the caudal, pectoral, and ventral fins is covered with small scales.

Br. VII: VII; D XII, 16; A III, 13; C 4, 1, 8, 7, 1, 3; V I, 5; P 18.

The dorsal region is purplish brown, the abdominal region yellowish. Oblique dark streaks follow the rows of scales above the lateral line, and longitudinal ones upon the middle of the abdomen beneath the same lateral line. This two-fold system of lines having suggested the specific name.

Plate IX, fig. 1, represents *Orthopristis duplex*, size of life; fig. 2, is a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
724	2	Adult..	Indianola, Texas.....	1851	Col. J. D. Graham....	Alcoholic.	Jno. H. Clark.....
725	4	Young.	Brazos Santiago, Texas.....	1853	G. Würdemann.....	....do....	G. Würdemann.....

Family SPARIDAE.

The fishes of this family have, as common characters, a body ovate in profile, sometimes rather deep, at others somewhat elongated, always covered by well developed scales, generally ctenoid in structure. The spinous portion of their dorsal fin is continuous with the soft portion,

constituting one undivided and scaleless fin; the ventrals being inserted under the pectorals or somewhat posteriorly.

The mouth is not protractile and the palate always toothless. The maxillar teeth present themselves under various aspects characteristic of the genera. The opercular apparatus is perfectly smooth, the free edges of its bones being without either spines or denticulations. The branchial apertures are wide and continuous under the throat; the branchiostegal rays being five or six in number on either side.

LAGODON RHOMBOIDES, Holbr.

Plate IX, Figs. 13—16.

Spec. Char.—Body rather short and deep; greatest depth across the thoracic region equal to the third of the entire length. Head very declivous anteriorly and forming about the fourth of the total length; the snout being sub-conical, the mouth somewhat protractile, and when in its retracted state, the gape is horizontal. The posterior extremity of the maxillary reaches a vertical line drawn immediately behind the posterior nasal aperture. The snout is sub-conical and thickish, and the supraocular region depressed. The eye is well developed, sub-circular in shape; its horizontal diameter entering about three times and a half in the length of the side of the head. A vertical line dropped from the origin of the dorsal fin would pass between the gill opening and the base of the pectoral. The posterior extremity of the dorsal is even with that of the anal and does not quite reach the insertion of the caudal. The pectorals are elongated, their extremity extending beyond the origin of the anal, which is hardly reached by the tips of the ventrals.

Syn.—*Sparus rhomboides*, Linn. Syst. nat. ed. XIIa, 1766, 170.—Shaw, Gen. Zool. IV, 1800, 447.

Sargus rhomboides, Cuv. & Val. Hist. nat. Poiss. VI, 1830, 69, pl. 143.—DeKay, N. Y. Fauna IV, 1842, 93, pl. lxi, fig. 228.—Storer, Synops. 1846, 81.

Lagodon rhomboides, Holbr. South. Ichthyol. 1855, 56, pl. viii, fig. 1.

The scales above the lateral line are deeper than long, and beneath it, longer than deep; the lines of growth are sub-concentric, the pectinations inconspicuously develvoped; the radiating furrows existing upon the anterior section only.

Br. VI: VI; D XII, 11; A III, 11; C 5, 1, 8, 7, 1, 6; V I, 5; P 1, 16.

The dorsal region is light reddish brown, with a bluish metallic reflect, whilst the sides and abdomen are silvery. Seven distinct transverse narrow blackish bands may be observed along the back, tapering towards the belly. The first of these fasciæ is occipital, the second subthoracic, and the seventh being caudal. Indistinct interyening fasciæ may be observed in young specimens. In all, young and adult, there exists a round dark spot at the intersection of the second fascia with the lateral line.

Plate IX, fig. 13, represents *Lagodon rhomboides*, size of life; fig. 14 is a scale from the dorsal region; fig. 15, a scale from the lateral line; and, fig. 16, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
731	6	Adult.	Brazos	1853	Major Emory	Alcoholic	John H. Clark
732	6	.....	Indianola, Texas	1851	Col. J. D. Graham	do	do
733	3	.....	St. Joseph's Island, Texas	1853	G. Würdemann	do	G. Würdemann
734	5	.....	Brazos Santiago	1853	do	do	do
735	2	Young	Indianola, Texas	1854	Major Emory	do	Dr. C. B. Kennerly
736	6	..do..	.....do	1851	Col. J. D. Graham	do	John H. Clark

Family MAENIDAE.

In their general aspect the representatives of this family resemble the *Sparidae* to a very great extent: the spinous portion of the dorsal fin is either continuous with the soft portion, else more or less separated from it. The insertion of the ventrals being placed under the base of the pectorals or somewhat posteriorly to it, and the caudal fin more or less emarginated or furcated. The essential differences consisting in the protractility of the mouth, and the presence upon the jaws of velvet-like teeth, and occasionally of a few canines. Similar velvet-like teeth may be observed: sometimes on the vomer, at others, on the palatine bones; else the palate is perfectly smooth or toothless. The edge of the preopercle is serrated in some and entire in others.

EUCINOSTOMUS, B. & G.

GEN. CHAR.—Mouth small and very protractile, which, when protruded, presents a sub-conico-tubular appearance; lips thin; maxillar teeth; palate and tongue toothless; opercular apparatus without either spines or serratures. Gill apertures continuous under the throat. First dorsal fin contiguous to the second at the base; outline between the two depressed. Caudal fin furcated. Three spiny rays at the anterior margin of the anal. Scales well developed.

SYN.—*Eucinostomus*, B. & G. in Ninth Ann. Rep. Smiths. Instit. (1854) 1855, 334.

The second spine, in both the dorsal and anal fins, is much less developed than in *Gerres*, to which genus the present one bears close affinities. The same remark applies to the spine of the ventral fins. Another distinctive trait between *Gerres* and *Eucinostomus* consists in the former having the edge of the preopercle serrated, whilst it is perfectly smooth in the latter.

EUCINOSTOMUS ARGENTEUS, B. & G.

PLATE IX, FIGS. 9—12.

SPEC. CHAR.—The body is rather short and deep, the greatest depth at the thoracic region being a little more than the third of the total length. The head, which is sub-pyramidal, constitutes about the fourth of the total length; the mouth, when retracted, exhibits a horizontal gape, and then the posterior extremity of the maxillary extends to a vertical line drawn inwardly to the anterior rim of the orbit. The eye is large and circular; its diameter being contained but three times in the length of the side of the head. The nostrils are situated towards the upper surface of the snout and nearer the orbit than the extremity of the jaws. The base of the spinous portion of the dorsal fin is somewhat shorter than that of the soft portion of the same fin. The posterior extremity of the dorsal is nearly even with that of the anal. The pectorals are longer and more slender than the ventrals.

SYN.—*Eucinostomus argenteus*, B. & G. in Ninth Ann. Rep. Smiths. Instit. (1854) 1855, 335.

The scales are deeper than long, anteriorly truncated, and rounded upon the remaining three margins. Radiating furrows may be observed upon the anterior section of the scale, and the lines of growth, instead of being concentrical or sub-concentrical, are absolutely vertical. The posterior section is cellular, and the pectinations, if they exist at all, must be exceedingly minute, for we have not detected them.

Br. IV: IV; D IX, 10; A III, 8; C 5, 1, 8, 8, 1 4; V I, 5; P 13.

The ground color is silvery; the dorsal region being of a light reddish brown, with a darker spot upon the centre of the scales. A black spot at the summit of the spinous dorsal. Transverse, blackish bands or fasciae may be observed in very young specimens.

Plate IX, fig. 9, represents *Eucinostomus argenteus*, size of life. Fig. 10, is a scale from the dorsal region; fig. 11, a scale from the lateral line; and fig. 12, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
720	10	Adult.	Brazos Santiago, Texas	1853	G. Würdemann ..	Alcoholic ..	G. Würdemann ..
721	18	Young	Brazos, Texas	1853	Major Emory.....	....do.....	John H. Clark ...
722	2	..do..	Indianola, Texas	1853	.....do.....	....do.....	Dr. C.B.Kennerly.
723	10	..do..	St. Joseph's Island, Texas.....	1853	G. Würdemann ..	....do.....	G. Würdemann ..

NEOMAENIS, Girard.

Gen. Char.—Mouth large, not very protractile. Jaws equal; velvet-like teeth along the middle and front of the vomer, along the palatines and jaws; the latter exhibiting an exterior row of larger, acute, and conical ones; whilst two canine-like, still larger, exist at the extremity of the upper jaw. Tongue smooth and toothless. Edge of preopercle finely serrated. Gill apertures continuous under the throat; branchial rays seven. One continuous dorsal fin. Caudal fin posteriorly sub-truncated or sub-emarginated. Three spiny rays at the anterior margin of the anal.

NEOMAENIS EMARGINATUS, Grd.

Plate IX, Figs. 5—8.

Spec. Char.—Body moderately elongated, compressed, sub-fusiform in a profile view. Head sub-conical, contained three times and a half in the total length. Posterior extremity of the maxillary extending to a vertical line drawn somewhat inwardly to the anterior rim of the orbit. Eye sub-circular; its longitudinal diameter entering about four times in the length of the side of the head: the rostral distance in advance of the eye being somewhat more than one of its diameter. External soft ray of ventrals prolonged into a membranous thread stretching beyond the posterior margin of these fins, although not reaching the origin of the anal, when bent in that direction. The caudal fin, which constitutes about the fifth of the entire length, is posteriorly sub-concave. The origin of the dorsal is placed opposite the base of the pectorals, the spinous portions being longer than the soft. The origin of the anal is situated posteriorly to the anterior soft rays of the dorsal. Ventrals inserted behind the base of the pectorals.

Syn.—*Lobotes emarginatus*, B. & G. in Ninth Ann. Rep. Smiths. Instit. (1854) 1855, 332.

The scales are well developed, somewhat deeper than long, except in the lateral line, where they are also considerably smaller and posteriorly tapering; radiating furrows may be observed upon their anterior section alone, their posterior section exhibiting fine pectinations.

Br. VII: VII; D X, 14; A III, 8; C 5, 1, 8, 7, 1, 6; V I, 5; P 1, 15.

The ground color is greenish olive with oblique, sometimes, undulating series of purplish brown spots, one of which on each scale, extending likewise over the vertical fins and occasionally confluent, constituting continuous narrow bands. The throat and abdomen are rather yellowish and unicolor.

Plate IX, fig. 5, represents *Neomaenis emarginatus*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
719	1	Brazos Santiago, Texas.....	1853	G. Würdemann.....	Alcoholic.	G. Würdemann.....
738	1	Mouth of Rio Grande del Norte.	1853	Major Emory.....	....do....	Jno. H. Clark.....

Family POLYNEMIDÆ.

POLYNEMUS OCTONEMUS, Grd.

PLATE X, FIGS. 5—9.

SPEC. CHAR.—The head enters about four times and a half in the total length, the snout being sub-conical, the mouth rather large and wide, the posterior extremity of the maxillary extending to a vertical line drawn considerably behind the orbit. The eye is large and sub-circular; its horizontal diameter being contained about four times in the length of the side of the head. The edge of the preopercle is finely serrated, the lower spine, situated near the convexity of the limb of that bone, is much larger than the rest. The thoracic filaments are eight in number, the tip of the longest ones extending beyond the origin of the anal fin. The posterior extremity of the ventrals barely reach the vent and extend somewhat further backwards than the extremity of the pectorals.

The scales are deeper than long, pectinated upon their posterior section and furrowed upon the anterior section. The lateral line, from the scapular region, takes a direct course towards the middle of the caudal fin. The accompanying figure will give an accurate idea of the form and relative position of the fins:

Br. VII: VII; D VIII, I, 12; A III, 13; C 6, 1, 8, 7, 1, 5; V I, 5; P 15.

Plate X, fig. 5, represents *Polynemus octonemus* size of life; fig. 6 is a magnified view of the head in order to show more particularly the denticulations of the limb of the preopercle; fig. 7 is a dorsal scale; fig. 8, a scale from the lateral line; and fig. 9, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig'l No.	Nature of specimens	Collected by—
739	8	Adult.	Brazos Santiago, Texas..	1853	G. Würdemann.....	.....	Alcoholic.	G. Würdemann.....
762	2	Young	Galveston, Texas.....	1853	Lt. A. W. Whipple...	3	....do....	Dr.C.B.Kennerly....

Family ATHERINIDÆ.

Two species of this family may be recognized in the collections under examination, one from the fresh waters of the interior of Mexico, specimens of which were collected by Major Rich and Jno. Potts, esq., the other from the salt and brackish waters of Indianola, St. Joseph's island, Brazos, and the mouth of the Rio Grande del Norte (Rio Bravo), the specimens having been collected by Jno. H. Clark, under Col. J. D. Graham and Major Emory, and by Mr. Gustavus Würdemann, of the United States coast survey. Both of the above species belong to the genus *Atherinopsis*, and will be described on a future occasion.

Family MUGILIDÆ.

The body is sub-cylindrical, owing to the thickness of the dorsal region. The scales generally are large, ctenoid in structure, and cover likewise the upper surface of the head. There is no lateral line properly so to be called, every scale being provided with a mucous hole. The dorsal fins are widely apart; the ventrals, almost abdominal, are situated on a vertical line drawn between the pectorals and the anterior dorsal. The teeth are exiguous, and sometimes even wanting. The maxillar bones are small and almost buried in the thickened lip which covers the premaxillaries. The sub-orbitar bone is often contiguous to that lip, when the mouth is closed, concealing entirely under its edge the maxillary.

MUGIL BERLANDIERI, Grd.

Plate X, Figs. 1—4.

Spec. Char.—The head enters about four times and a half in the total length, in which the greatest depth is contained five times or a little more. The caudal fin is equal to the head in length. The lower jaw is a little shorter than the upper; the teeth are exceedingly small, scarcely perceptible upon the dentaries (lower jaw); they are more apparent upon the outer premaxillar row, although those placed in the rear are not more developed than those of the lower jaw. A patch of asperities is felt upon the palatines; the vomer is smooth and preceded anteriorly by a wide transverse groove, such as may be observed in several other species; similar asperities exist at the sides of the base of the tongue. The edge of the preorbitar bone, under which the maxillary is concealed when the mouth is closed and retracted, is denticulated posteriorly.

The anterior third of the dorsal and anal, the base of the pectorals, and the caudal almost entirely, are protected with small scales. The formula of the fins reads thus:

D IV, I, 8; A III, 9; C 3, 1, 6, 6, 1, 3; V I, 5; P 16.

The scales of the body are well developed, deeper than long, finely pectinated posteriorly and exhibiting diverging furrows upon their anterior section alone; the mucous aperture is elongated and placed almost exclusively upon the posterior section. Fourteen longitudinal series may be counted from the base of the first dorsal fin to the mesial line of the abdomen in advance of the vent. In a longitudinal series from the branchial aperture to the insertion of the caudal there are from forty to forty-two scales.

The upper surface of the head and the dorsal region exhibit a greyish tint, whilst the flanks are silvery, and the sides of the head and the abdomen pervaded with a yellowish or golden reflect; longitudinal greyish lines, more or less conspicuous, may be traced along the series of scales. The fins are uniform light yellow or olive, the base of the pectorals alone being blackish.

Plate X, fig. 1, represents *Mugil berlandieri*, size of life, it being one of the largest specimens observed; fig. 2 is a scale from the dorsal region; and fig. 3, a scale from the abdominal region; fig. 4 exhibits a young specimen caught in the same net and supposed to belong to the same species.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig'l No.	Nature of specimens.	Collected by—
763	4	A.&Y	St. Joseph's Island, Tex.	1853	G. Würdemann.....	.....	Alcoholic.	G. Würdemann.....
764	12	..do..	Indianola, Tex.....	1851	Col. J. D. Graham....	.....	....do....	Jno. H. Clark.....
765	5	..do..	Brazos Santiago, Tex....	1853	G. Würdemann.....	.....	....do....	G. Würdemann.....
766	8	Young	Brazos.....	1853	Major Emory.....	.....	....do....	Jno. H. Clark.....
767	12	..do..	Galveston, Tex.....	1853	Lt. A. W. Whipple...	3	....do....	Dr. C. B. Kennerly....

Family SCOMBRIDAE.

This family, as it stands in the systematic writers, includes a long series of genera most diversified in shape and in structure. None needs a more thorough anatomical investigation in order to enable us to define it as a group, if a natural group it proves to be. We cannot help thinking that characters will be detected by the aid of which the various groups already delineated by superficial traits may be erected into as many natural families.

CHORINEMUS, Cuv. & Val.

The limits of this genus are anything but well defined, and not having at our command the proper materials towards a revision of its characters, we are compelled to record the following species under its heading. Some attention ought to be paid to the dentition of the various

species in order to ascertain whether better groups could not be formed, based chiefly upon that character.

CHORINEMUS LANCEOLATUS, Grd.

Plate XI, Fig. 5.

Spec. Char.—Body elongated, very much compressed and quite tapering from the origin of the second dorsal and anal to the peduncle of the tail. Head constituting about the fifth of the total length; snout elongated and sub-conical; gape of the mouth oblique; jaws sub-equal, lower one longest; posterior extremity of the maxillary extending to a vertical line drawn midway between the pupil and the posterior rim of the orbit. Patches of slender and acute teeth on the vomer, palatines, and tongue; a double row of them on either jaws. Eye well developed and circular; its diameter entering three times and a half in the length of the side of the head: exactly once in advance of its anterior rim. Pectorals and ventrals of moderate devel. opment; ventrals inserted opposite the base of the pectorals.

The surface of the body presents the aspect of minute longitudinal wrinkles into which small, elongated scales are imbedded. The lateral line, from the scapular region slightly ascends to nearly opposite the origin of the first dorsal fin, hence descending in slight undulations until on the middle of the flank, then straight to the base of the caudal fin.

Br. VIII: VIII; D V, 21; A II, 21; C 8, 1, 8, 8, 1, 8; V 6; P 1, 15.

The dorsal region is bluish; the sides of the head and body being silvery, and the fins unicolor.

Plate XI, fig. 5, represents *Chorinemus lanceolatus*, size of life. It is proper to remark that the interradial membrane in the second dorsal and anal fins is much less developed than represented on the figure, thus giving the rays a greater freeness.

List of specimens.

Catal. No.	No. of Spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of Specimen.	Collected by—
710	1	.....	St. Joseph's Island, Texas...	1853	G. Würdemann	Alcoholic.	G. Würdemann .....

CHLOROSCOMBRUS. Girard.

Gen. Char.—Elongated and narrow patches of velvet-like teeth on the jaws, vomer, and palatine bones; tongue smooth; mouth rather small and slightly protractile, its gape being oblique and the tip of the lower jaw projecting in front of the upper; body rather short and deep, scaly; lateral line unarmed, that is, not shielded; pectoral fins falciform; two small spines in advance of the anal fin. Ventrals very small. A small horizontal spine, directed forwards, in advance of the first dorsal.

Were it not for the unarmed lateral line, the species upon which the present genus is founded would readily be taken for a *Caranx*.

To this genus belongs *Seriola cosmopolita*, Cuv. & Val. and which is closely allied to the following one.

CHLOROSCOMBRUS CARIBBAEUS, Grd.

Plate XI, Fig. 6.

Spec. Char.—Body deep and rather short, very much compressed, with the ventral outline more convex than the back, which on a profile view constitutes a very depressed curve. Peduncle of tail exiguous; caudal fin deeply furcated. Head forming a little more than the fifth of the length. The snout is short, slightly protractile; the mouth being rather small, its gape very oblique, and the lower jaw projecting somewhat beyond the upper. The posterior extremity of the maxillary extends to a vertical line drawn across the anterior rim of the orbit. The eye is well developed, sub-circular, its diameter entering about three times in the length of the side of the head. Pectorals well developed and falciform; ventrals very small, inserted upon a vertical line drawn immediately behind the base of the pectorals.

The body is covered with small and inconspicuous scales, the lateral line forming anteriorly an arc of a circle, being straight along the flank to the base of the caudal, where it is provided with more conspicuous scales.

Br. VII: VII; D VIII; 29; A II, 29; C 6; 1, 7, 7, 1, 6; V 6; P 1, 16.

The color of the dorsal region is purplish blue, a tint probably altered by the alcohol; the sides of the head and flanks being silvery. A black spot may be observed upon the peduncle of the tail near the insertion of the caudal fin. The fins themselves are of a uniform light olive.

Plate XI, fig. 6, represents *Chloroscombrus caribbaeus*, size of life.

List of specimens.

Catal. No.	No. of Spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of Specimen.	Collected by—
714	3	.....	St. Joseph's Island, Texas...	1853	G. Würdemann.....	Alcoholic.	G. Würdemann.....

DOLIODON, Girard.

Gen. Char.—Head small; snout bluntly rounded with the mouth situated beneath it. Mouth small; velvet-like teeth upon the jaws and front of the vomer; none on the palatines and tongue. Body rather short, minutely scaly; lateral line unarmed. Dorsal and anal spines united together by a membrane and contiguous to the soft and articulated portion of these fins.

We are at a loss to account for the fact of Dr. Holbrook identifying the species upon which this genus is founded, with *Trachinotus pampanus*, Cuv. & Val., and which is the type of his genus *Bothrolaemus*, characterized by the total absence of teeth.

The *Zeus spinosus* of Mitchill belongs to this genus of which it will constitute the second species.

DOLIODON CAROLINUS, Grd.

Plate XI, Fig. 4.

Spec. Char.—Body sub-ellipsoid, rather short, deep, compressed. Head contained four times and a half in the total length. Snout thick, blunt, and rounded. Mouth moderate, slightly protractile, placed beneath the snout, with its gape nearly horizontal, the upper jaw alone forming a slight arch over the lower one, which is the shortest. The posterior extremity of the maxillary extending to a vertical line drawn across the posterior rim of the pupil. The eye is well developed and circular; its diameter entering about three times and a half in the length of the side of the head. Pectorals and ventrals of moderate development; ventrals somewhat smaller than the pectorals, and inserted upon a vertical line drawn posteriorly to the base of the latter.

Syn.—*Lichia carolina*, DeKay, N. Y. Fauna, IV, 1842, 114, pl. x, fig. 3.—Storer, Synops. 1846, 96.—Bd. in Ninth Ann. Rep. Smiths. Instit. (1854) 1855, 345.

The scales are very minute, inconspicuous; the lateral line, slightly arched upon its anterior half, is nearly straight posteriorly, undergoing slight undulations.

Br. V: V; D VII, 24; A III, 22; C 7, 1, 8, 8, 1, 6; V I, 5; P 1, 18.

The upper regions are bluish purple; the inferior regions appearing as though washed with gold and silver. The upper portion of the second dorsal is blackish; the rest of the fins being light olive.

Plate XI, fig. 4, represents a small specimen of *Doliodon carolinus*, size of life.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
713	5	St. Joseph's Island, Texas	1853	G. Würdemann ..	Alcoholic ..	G. Würdemann ..

CARANGUS, Girard.

GEN. CHAR.—Narrow patches of velvet-like teeth on the palatines, front of vomer, and upper jaw, which is, moreover, provided with an external row of small ones of a conical and acerated form. The lower jaw having but one row of the latter kind. Profile of the head more or less rounded or convex. A small horizontal spine directed forwards in advance of the first dorsal. Two spines in advance of the anal. Pectoral fins elongated and falciform. Lateral line shielded along the flank and peduncle of the tail.

To this genus we can already refer with certainty *Caranx chrysos*, CUV. & VAL.; *Caranx fallax*, CUV. & VAL.; *Caranx pisquetus*, CUV. & VAL.; *Caranx bartholomaei*, CUV. & VAL.; *Caranx defensor*, DEKAY; *Caranx falcatus*, HOLBR.; and, *Caranx richardi*, HOLBR.

CARANGUS ESCULENTUS, Grd.

PLATE XI, FIGS. 1—3.

SPEC. CHAR.—Body compressed; greatest depth contained three times in the total length, in which the head enters four times. Caudal deeply furcated, either lobe being equal to the head in length. The diameter of the eye is contained four times in the length of the side of the head. The gape of the mouth is slightly oblique, the posterior extremity of the maxillary corresponding to a vertical line intersecting the posterior rim of the pupil. Two canine teeth, larger than the rest, near the symphysis of the lower jaw: one on either side. Lateral line curved from its origin to opposite the fifth or sixth ray of the second dorsal, hence straight and shielded to the base of the caudal. Scales small and inconspicuous in young specimens.

SYN.—*Scomber carangus*, BLOCH.—SHAW, Gen. Zool. IV, 1800, 599.
Caranx carangus, CUV. & VAL. Hist. nat. Poiss. IX, 1833, 91.—STORER, Synops. 1846, 101.

The general coloration is silvery, with a lead or violet tint along the upper surface of the head and dorsal region. A black spot upon the edge of the opercle; a bluish patch at the posterior edge of the elevated portion of the second dorsal fin, and a brownish filet along the edge of the caudal. The fins otherwise are yellowish. The young exhibit dark vertical bands (figs. 2 and 3). These bands are sometimes still present on specimens of the size of fig. 1.

Plate XI, fig, 1—3, represents three stages in the growth of *Carangus esculentus*, which is said to attain occasionally a weight of twenty-five pounds.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
708	12	.....	Brazos Santiago, Texas.....	1853	G. Würdemann	Alcoholic.	G. Würdemann.....
709	1	Young	Mouth of Rio Grande del Norte (Rio Bravo).	1853	Major Emory	....do....	John H. Clark.....
715	3	.....	Brazos Santiago, Texas.....	1853	G. Würdemann	....do....	G. Würdemann.....

ARGYREIOSUS CAPILLARIS, DeKay.

PLATE XI, FIG. 7.

SPEC. CHAR.—The greatest depth taken obliquely between the origin of the second dorsal and the insertion of the ventrals is equal to the length measured from the extremity of the snout to the origin of the caudal peduncle. The snout itself is slightly protruding, and the profile of the head steeper than in *A. vomer*. The outline of the occipital region constitutes an arc of a circle rather than a plane. The peduncle of the tail is somewhat inclined downwards. Anterior two rays of the dorsal fin prolonged into long filaments.

SYN.—*Zeus capillaris*, MITCH. (non Bloch) in Trans. Lit. & Philos. Soc. N. Y. I, 1815, 383; pl. ii, fig. 2.
Argyreiosus capillaris, DEKAY, N. Y. Fauna, IV, 1842, 125; pl. xxvii, fig. 82.—STORER, Synops. 1846, 104.—BD. in Rep. Smiths. Inst. IX, (1854) 1855, 337.

The color is of a brilliant silvery lustre; the dorsal and ventral filament being blackish. Plate XI, fig. 7, represents *Argyreiosus capillaris*, size of life, although not fully grown.

List of specimens.

Catal. number.	No. of spec.	Locality.	Whence obtained.	Nature of specimen.	Collected by—
712	2	Matamoras, Mexico.....	D. N. Couch	Alcoholic ..	L. Berlandier.....

VOMER SETAPINNIS, Grd.

PLATE XI, FIG. 8.

SPEC. CHAR.—Greatest depth somewhat more than the half of the total length in all the specimens now before us, the largest of which we have caused to be figured. The rule appears to be that the depth is less than the half of the length, the body being proportionally more elongated than represented in the accompanying figure.

SYN.—*Zeus setapinnis*, MITCH. in Trans. Lit. & Philos. Soc. N. Y. I, 384, pl. 1, fig. 9.
Vomer brownii, CUV. & VAL. Hist. nat. Poiss. IX, 1833, 189; pl. cclvi.—DEKAY, N. Y. Fauna, IV, 1842, 127; pl. xxv, fig. 78.—STORER, Synops. 1846, 105.

The color is of a brilliant silvery tint, somewhat greyish along the dorsal region, especially in full grown specimens. The second dorsal being minutely black dotted, and the pectorals olivaceous.

Plate XI, fig. 8, represents, size of life, *Vomer setapinnis*, not quite fully grown.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
711	5	Brazos Santiago, Texas .	1853	G. Würdemann	Alcoholic ...	G. Würdemann .....

Family TAENIOIDAE.

We are indebted to G. Würdemann for two specimens of *Trichiurus lepturus*, Linn., collected, one at St. Joseph's Island, the other at Brazos Santiago, along the Texan shore of the Gulf of Mexico.

Family GOBIDAE.

GOBIONELLUS, Girard.

It is our design to place in this genus such species of Gobioids, the body of which is generally elongated, and always protected with scales: having likewise two dorsal fins, an anal nearly as long as the second dorsal, and an elongated and pointed caudal fin.

Under this appellation will come *Gobius lanceolatus*, *G. bacalaus*, and *G. smaragdus*, all three inhabitants of the Caribbean sea; and, finally, *G. brasiliensis* also.

GOBIONELLUS HASTATUS, Grd.

Plate XII, Figs. 7 and 8.

Spec. Char.—Head contained about seven times in the total length. Snout anteriorly rounded; jaws sub-equal; gape of the mouth oblique; posterior extremity of maxillary extending to a vertical line drawn back of the pupil. Branchial isthmus rather wide. First dorsal fin somewhat lower than the second. Caudal lanceolated. Anal fin as long as the second dorsal, and almost evenly opposed to it. Ventrals not reaching the vent. Pectorals extending as far back as the ventrals.

Scales well developed, as deep as long. Color reddish brown, lighter beneath than above; fins unicolor.

D VII, 14; A 15; C 3, 9, 8, 3; V 5; P 14.

Plate XII, fig. 7, represents *Gobionellus hastatus*, size of life. Fig. 8 is one of its scales magnified.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
645	1	Adult.	St. Joseph's Island, Tex.....	1854	G. Würdemann...	Alcoholic..	G. Würdemann...

1. GOBIUS LYRICUS, Grd.

Plate XII, Figs. 4 and 5.

Spec. Char.—Body compressed, fusiform in profile. Head anteriorly rounded, contained five times and a half in the total length. Jaws sub-equal; gape of the mouth nearly horizontal; posterior extremity of maxillary reaching a vertical line drawn through the pupil. Branchial isthmus wide. Dorsal fins not contiguous. Middle rays of first dorsal filiform and membranous at their tips, higher than the second dorsal, the posterior rays of which, as also those of the anal, reach the base of the caudal. The caudal fin itself is lanceolated, and the anal nearly as long as the second dorsal. The tips of the ventrals reach the vent. The extremities of the pectorals project further back than the ventrals.

Scales rather large, somewhat longer than deep, posteriorly sub-angular. Color reddish brown, obscurely barred with blackish brown.

D VI, 12; A 12; C 5, 8, 7, 4; V 5; P 16.

Plate XII, fig. 4, represents *Gobius lyricus*, size of life. Fig. 5 is one of its scales magnified. The dorsal fin is not correctly delineated.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
646	8	Adult & Young.	Brazos Santiago, Texas....	1854	G. Würdemann...	Alcoholic..	G. Würdemann...

2. GOBIUS WÜRDEMANNI, Grd.

Observ.—Resembles very much the preceding species, of which it has the general physiognomy. The head is somewhat larger, the caudal fin shorter, as well as the ventrals, and the anal not so deep.

D VI, 11; A 12; C 4, 8, 8, 3; V 5; P 16.

The scales are also smaller. The color is reddish brown, obscurely barred with blackish.

The third dorsal spine is the longest and bears a filiform membranous appendage not quite so much developed as in *G. lyricus*. The teeth are very slender, and a good deal smaller than in the latter species.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained	Nature of specimen.	Collected by—
647	1	Adult.	Brazos Santiago, Texas.....	1854	G. Würdemann..	Alcoholic..	G. Würdemann..

3. GOBIUS CATULUS, Grd.

PLATE XII, FIGS. 9 and 10.

SPEC. CHAR.—Body sub-fusiform. Head somewhat declivous forwards, constituting not quite the fourth of the entire length. Jaws even; gape of the mouth somewhat oblique; posterior extremity of maxillary extending to a vertical line which would intersect the pupil. Branchial isthmus very wide. Dorsal fins not contiguous; base of the second somewhat longer than that of the first. Caudal posteriorly rounded. Anal rather short and nearly as deep as the second dorsal is high; its origin being situated opposite the third or fourth ray of the latter mentioned fin and nearly even with it behind. Ventrals rather broad, not extending to the vent. Pectorals broad also and rounded; their extremities reaching a vertical line intersecting the vent.

Scales of moderate size, longer than deep, posteriorly tapering, with numerous radiating furrows. Color olivaceous brown, transversely maculated with blackish brown.

D VI, 11; A 11; C 3, 8, 8, 3; V 5; P 14.

Plate XII, fig. 9, represents *Gobius catulus*, size of life. Fig. 10 is one of its scales.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
648	2	Adult.	St. Joseph's Island, Texas...	1854	G. Würdemann..	Alcoholic..	G. Würdemann...

4. GOBIUS GULOSUS, Grd.

SPEC. CHAR.—The head, which has an elongated appearance, is compressed like the body, constitutes the fourth, or somewhat less, of the total length. The snout is sub-conical, the mouth large and very deeply cleft, with its gape oblique, and the lower jaw slightly longer than the upper. The posterior extremity of the maxillary extends to a vertical line drawn altogether behind the entire orbit. The eyes are rather small, situated towards the upper surface of the head; the inter-ocular space being about equal in width to the half of the ocular diameter, which enters nearly five times in the length of the side of the head. The branchial isthmus is moderately wide. The first dorsal fin is not contiguous to the second; it is also higher; two of its middle rays being filiform at their extremities; the posterior rays of the second dorsal and those of the anal barely reach the insertion of the caudal, the latter stretching a little further than the former. The posterior margin of the caudal itself is rounded. The extremity of the ventrals extends to the vent; the pectorals are longer still, rather broad and well developed.

The scales are of moderate development, deeper than long, with numerous radiating furrows upon their posterior section.

D VI, 15; A 15; C 4, 7, 7, 3; V 5; P 18.

The ground color is olivaceous brown; the dorsal region, the upper surface and upper portion of the sides of the head being maculated with black; the spots having a tendency to constitute oblique transverse bands along the dorsal region, and longitudinal ones on the sides of the head.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
797	3	Adult & Young.	Indianola, Texas....	1851	Col. J. D. Graham..	Alcoholic ..	Jno. H. Clark..

GOBIOSOMA, Girard.

There are other Gobioids, which, under an external appearance of *Gobius*, are, nevertheless, entirely deprived of scales. To include these we frame the above genus. The species which inhabit the coast of South Carolina and known under the name of *Gobius alepidotus* (*G. viridipallidus*, or *G. boscii*), belongs to this type.

GOBIOSOMA MOLESTUM, Grd.

PLATE XII, FIG. 14.

SPEC. CHAR.—Head large, depressed, superiorly flattened, constituting a little less than the fourth of the total length. Eyes small, situated near the top of the head. Snout rounded; jaws even; posterior extremity of the maxillary reaching a vertical line drawn in advance of the pupil. Branchial isthmus very wide. Dorsal fins contiguous at their base. Caudal posteriorly rounded. Anal shorter than the second dorsal. Ventrals quite small, not extending to the vent. Pectorals broad and well developed, extending much beyond the ventrals.

Body and head scaleless. Color dusky brown; fins with blackish streaks.

D VII, 12; A 12; C 2, 8, 8, 2; V 5; P 16.

The soft rays of the fins are bifurcated, a structure not exhibited on the figure.

Plate XII, fig. 14, represents *Gobiosoma molestum*, size of life.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
644	1	Adult.	Indianola, Tex	1851	Col. J. D. Graham..	Alcoholic ..	John H. Clark.....

Family BLENNIDAE.

BLENNIUS MULTIFILIS, Grd.

PLATE XII, FIG. 6.

SPEC. CHAR.—Head contained four times and a half in the total length. Posterior extremity of maxillary reaching a vertical line drawn through the pupil. Cutaneous flap above the eyes provided on either side and near the base with four filiform cirrhi. Spinous portion of dorsal fin lower and somewhat longer than the soft portion which is contiguous to the base of the caudal. Posterior margin of caudal fin rounded off. Origin of anal situated in advance of the anterior soft ray of the dorsal. Pectorals broad; their extremities extending as far back as the anterior margin of the anal. Blackish brown above, reddish brown beneath; dorsal region, dorsal and caudal fins with roundish spots, more conspicuous in the young than in the adult.

A broad isthmus separates the gill apertures under the throat. There are four canine teeth, two upper and two lower, one on either side. The lower ones are larger than the upper.

Br. V: V; D XIII, 14; A II, 18; C 3, 1, 5, 5, 1, 3; V 1, 3; P 15.

Plate XII, fig. 6, represents *Blennius multifilis*, size of life.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
649	1	Adult.	St. Joseph's Island, Tex..	1854	Gust. Würdemann..	Alcoholic..	G. Würdemann ....
649	17	Young.	.....do.....	1854	.....do.....	....do	.....do.....

1. ELEOTRIS SUMNULENTUS, Grd.

PLATE XII, FIGS. 1—3.

SPEC. CHAR.—Body sub-fusiform. Head contained about four times and a half in the total length. Snout rounded; jaws equal; gape of mouth somewhat oblique; posterior extremity of maxillary extending to a vertical line intersecting the anterior rim of the orbit. Eye circular; its diameter entering four times and a half in the length of the side of the head. Branchial isthmus narrow. Second dorsal fin higher than the first; its posterior rays, like those of the anal, being the longest, and their extremities approximating the base of the caudal when inclined in that direction. Tips of ventrals not reaching the vent. Extremities of pectorals stretching somewhat beyond the ventrals. Caudal fin of the same length as the head, and posteriorly rounded.

The scales are rather large, as deep as long; smaller on the upper surface of the head than on the body.

D VII, 9; A 10; C 4, 7, 7, 4; V 5; P 14.

Color reddish brown with interspersed light spots. A black spot above the insertion of the pectorals, and a streak from the eye to the angle of the mouth. Branchial apparatus purplish. Dorsals and anal spotted or barred. Caudal, ventrals, and pectorals greyish olive.

Plate XII, fig. 1, represents *Eleotris sumnulentus*, size of life. Fig. 2, its head from above. Fig. 3, one of its dorsal scales.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
641	1	Ad't&Y'g.	Mouth of Rio Grande del Norte (R. Bravo)..	1854	Maj. Emory..	Alcoholic.	Jno. H. Clark.

2. ELEOTRIS GYRINUS, Cuv. & Val.

PLATE XII, FIGS. 11 and 12.

OBSERV.—The specimen figured being the only one procured by the Commission, we are not prepared to compare it fully with its congeners, and since it approximates closely the species under which name we record it, we have thought advisable to wait until more materials shall be available before any attempt is made to establish either its specific identity with, or difference from, *Eleotris gyrinus*.

List of specimens.

Catal. No.	No. of spec.	Sex.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
642	1	♀	Mouth of Rio Grande (R. Bravo)...	1854	Maj. Emory....	Alcoholic..	John H. Clark..

PHILIPNUS DORMITATOR, Cuv. & Val.

PLATE XII, FIG. 13.

OBSERV.—We are likewise compelled to record under the above name the small fish represented on the accompanying plate. It is the only specimen we have ever seen, and was taken from the mouth of the preceding species, caught in the act of swallowing it. We entertain the hope that at no distant period we shall have an opportunity of elucidating whatever in the history of these two fishes will now appear as though left untold

List of specimens.

Catal. No.	No of spec.	Age.	Locality.	When collected.	Whence obtained	Nature of specimen.	Collected by—
643	1	Young.	Mouth of Rio Grande (R. Bravo).....	1854	Maj. Emory...	Alcoholic ...	John H. Clark...

Family PLEURONECTIDAE.

We recognize four different species of flat fish belonging to several genera. The specimens were procured at Indianola and Brazos by Jno. H. Clark under Col. J. D. Graham and Major Emory, and at St. Joseph's Island, by G. Würdemann.

Family ECHENEIDAE.

Two small specimens of a species of *Echeneis* were obtained at St. Joseph's Island, Texas, by Gustavus Würdemann of the United States Coast Survey.

Family OPHIDIDAE.

OPHIDION JOSEPHI, Grd.

SPEC. CHAR.—Head contained six times in the total length. The eye is moderate; its diameter is contained four times in the length of the side of the head. The posterior extremity of the maxillar bone extending to a vertical line drawn across the posterior rim of the orbit. The origin of the dorsal fin is situated at some distance behind the base of the pectorals. Ground color light olive sprinkled all over with brownish or purplish specks, except the sides of the head and the belly which are unicolor. The vertical fins being lined exteriorly with black.

Differs from *O. taylori* of the Pacific coast, by a shorter body, more elongated pectorals and a more backwards origin of both the dorsal and anal fins.

List of specimens.

Catal. No.	No. of Spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of Specimen.	Collected by—
868	2	.....	St. Joseph's Island, Texas...	1853	G. Würdemann.....	Alcoholic.	G. Würdemann.....

Family SCOMBERESOCIDAE.

BELONE SCRUTATOR, Grd.

PLATE XIII.

SPEC. CHAR.—Lower jaw longer than the upper; head constituting about the third of the total length. Middle region of cranium depressed and covered with scales; the gill covers, the branchial apparatus, cheeks and base of lower jaw are scaly. Eye large, sub-elliptical; its longitudinal diameter entering about twelve times in the length of the side of the head, eight times in advance of the orbit, and thrice posteriorly. The anal fin is larger than the dorsal; the caudal is sub-crescentic upon its posterior margin, its lobes being sub-equal.

The anterior portion of both the dorsal and anal fins is protected with small scales. The scales which cover the body are of moderate development, longer than deep, irregularly elliptical, exhibiting distant concentric striae but no radiating furrows.

Br. XIII: XIII; D 15; A 18; C 4, 1, 7, 6, 1, 3; V 6; P 13.

The upper region is greyish olive, the sides silvery with a dark narrow band of a metallic lustre, whilst the inferior region is yellowish olive. The fins being unicolor, of a greyish or yellowish olive, also.

Plate XIII, fig. 1, represents *Belone scrutator*, size of life; fig. 2 being a dorsal scale; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of Spec.	Age.	Locality.	When collected	Whence obtained.	Nature of Specimens.	Collected by—
833	2	Adult.	Brazos, Texas.....	1853	Major Emory	Alcoholic.	John H. Clark.....
834	2	Young.	St. Joseph's Island, Texas...	1853	G. Würdemann.....	....do....	G. Würdemann.....

Family LABRIDAE.

HERICHTHYS, B. & G.

GEN. CHAR.—Body compressed, sub-elliptical in its outline. Teeth small, sub-conical, simple, exterior row most conspicuous; lower lip entire. Branchiostegal rays five in number. Ventrals, dorsal, and anal fins acuminated; caudal rounded off posteriorly. Five or six spiny rays to the anal. Scales very large, ctenoid in structure; lateral line interrupted.

SYN.—*Herichthys*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 25.

This genus is allied to *Heros* of Heckel, from which it differs in the structure of the exterior row of maxillar teeth which are simple instead of exhibiting lateral hooks.

HERICHTHYS CYANO-GUTTATUS, B. & G.

PLATE IV, FIGS. 9—12.

SPEC. CHAR.—The head constitutes about two-sevenths of the total length. The snout is sub-conical, the frontal line depressed in advance of the eyes. Jaws even; three irregular rows of minute teeth placed immediately behind an anterior and more conspicuous row. Eyes well developed and circular; their diameter entering about four times and a half in the length of the side of the head. Posterior portion of the cheeks scaly; large scales on the opercular apparatus. Anterior margin of dorsal fin situated in advance of the insertion of the ventrals; the tip of its posterior rays projecting somewhat beyond those of the anal; both those of the anal and dorsal project beyond the base of the caudal in adult specimens. The insertion of the ventrals takes place backwards of the base of the pectorals; the exterior soft ray being much longer than the others. The caudal fin constitutes about two-ninths of the entire length.

SYN.—*Herichthys cyano-guttatus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 25.

The scales are very large, deeper than long; nineteen to twenty longitudinal series may be counted across the line of greatest depth. The lateral line is composed of twenty-six scales,

eighteen being counted from the upper angle of the opercle to the interrupted portion of that line and eight more along the peduncle of the tail.

D XVI, 9+1; A V or VI, 6+1; C 2, 1, 7, 7, 1, 3; V I, 5; P 14.

The ground color is brownish, scattered all over with small bluish spots. A black blotch is sometimes observed upon the middle of the spinous portion of the dorsal, and another on the dorsal region below the former. A third black blotch is observed at the base of the caudal fin. The young exhibit transverse blackish bands or fascia, which are sometimes observed, though faintly, upon rather large specimens.

Plate IV, fig. 9, represents *Herichthys cyano-guttatus*, size of life, but not full grown; fig. 10 is a scale from the dorsal region; fig. 11, a scale from the lateral line; and, fig. 12, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens	Collected by—
850	5	Young.....	Devil's river, Texas.....	1851	Col. J. D. Graham.	Alcoholic.	Jno. H. Clark....
851	14	Adult & Young.	Laguna; Fort Brown, Tex.	1853	Maj. Emory.....	....do....	.....do.....
852	8	.....do.....	Brownsville, Texas.....	1852	Capt. Van Vliet....	....do....	Capt. Van Vliet...
853	10	.....do.....	Matamoras, Mexico.....	1853	Lt. D. N. Couch....	....do....	L. Berlandier ....
854	4	.....do.....	.....do.....	1853	.....do.....	....do....	.....do.....
855	6	.....do.....	San Juan river, San Diego, near Cadereita.	1853	.....do.....	....do....	Lt. Couch.....
856	1	Adult.....	Cadereita, Mexico.....	1853	.....do.....	....do....	....do.....

Family SILURIDAE.

AILURICHTHYS, B. & G.

Gen. Char.—Head depressed, smooth, unarmed; snout broad and rounded off. Two pairs of flattened barbels; a maxillar pair, sometimes very much elongated; and a mental pair, always shorter. Velvet-like teeth on the pre-maxillaries and front of the vomer. Anterior margin of both dorsal and pectoral fins prolonged into a membranous thread, more or less elongated, according to the species. An adipose dorsal fin situated opposite the anal. Caudal more or less furcated.

Syn.—*Silurichthys*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 26.

This genus differs from *Galeichthys*, to which it is closely related, by the presence of two pairs of barbels only, instead of three. Accordingly *Galeichthys gronovii*, *G. eydouxii*, and *G. blochii*, of Cuvier and Valenciennes, must be referred to it.

AILURICHTHYS MARINUS, B. & G.

Salt water Cat-fish.

Plate XIV.

This well known and rather common species we have caused to be figured in order to supply a *desideratum*. Fig. 1, is taken from a specimen double that size; fig. 2, being an outline of the fish seen from above; and fig. 3, the head seen from beneath, exhibiting the shape of the mouth and the insertion of the mental pair of barbels.

Syn.—*Silurus marinus*, Mitch. in Trans. Lit. & Philos. Soc. N. Y. I, 1815, 433.
Galeichthys parus, Cuv. & Val. Hist. Nat. Poiss. XV, 1840, 33.
Galeichthys marinus, DeKay, N. Y. Fauna IV, 1842, 178; pl. xxxvii, fig. 118.—Storer, Synops. 1846, 149.
Silurichthys marinus, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 26.

The dorsal region is bluish, tinged with green or olive; the flanks being silvery and the belly of an opaque white. The fins are uniform greyish olive, the adipose alone being blackish.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
835	1	Adult..	Indianola, Texas.....	1851	Col. J. D. Graham..	Alcoholic	Jno. H. Clark....

ARIUS EQUESTRIS, B. & G.

Plate XV.

Spec. Char.—Head contained four times and three-quarters in the total length. Horizontal diameter of the eye contained five times in the length of the side of the head. Maxillary barbels extending to the middle of the length of the pectorals. Anterior margin of the dorsal fin thrice as high as its posterior margin, and equidistant between the extremity of the snout and the adipose; its superior margin being sub-concave. Adipose dorsal fin of medium size, and situated opposite the middle of the anal. The latter is deeper than long, and concave upon its outer edge. Extremities of the pectorals extending as far back as the posterior margin of the dorsal. Ventrals are nearly equidistant between the tip of the pectorals and the origin of the anal.

Syn.—*Arius equestris*, B & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 26.

The color is of a greyish argentine hue, somewhat darker along the dorsal region than on the flanks and the belly.

Br. V: V; D I, 7; A 16; C 13, 1, 7, 7, 1, 12; V 6; P I, 9.

Plate XV, fig. 1, represents *Arius equestris*, size of life; fig. 2 is an outline of the fish seen from above; fig. 3, an outline of the head seen from beneath, showing the shape of the mouth and the insertion of the mental barbels.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
836	1	Adult..	Indianola, Texas.....	1851	Col. J. D. Graham..	Alcoholic.	Jno. H. Clark....

1. PIMELODUS AFFINIS, B. & G.

Plates XVI & XVII.

Spec. Char.—The head is contained five times and a half in the total length, in which the caudal fin enters but five times. The eye is of medium size, its diameter entering a little more than six times in the length of the side of the head. The anal is very elongated, its base being somewhat more than the fourth of the whole length, and the tips of its posterior rays extend further back than the extremity of the adipose fin, which is inserted opposite the posterior third of the one just alluded to. The extremity of the pectoral fins extends nearly as far as a vertical line drawn at the posterior margin of the dorsal; the fins themselves being rather slender. The ventrals are broad, somewhat shorter than the pectorals, and extend beyond the anterior margin of the anal.

Syn.—*Pimelodus affinis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 26.

This species is very closely allied to *P. coerulescens*, Rafin. and distinguished from it by a more advanced position of the dorsal fin, and a greater elongation of the barbels; the maxillar

pair extending beyond the base of the pectorals; the inner mental pair being shorter than the external one. The supra-nasals are the smallest, and when lying over the surface of the head they extend as far back as a line drawn from one pupil to the other.

D I, 6; A 35; C 5, 1, 8, 7, 1, 6; V 8; P I, 10.

The color is reddish brown above, silvery white beneath, occasionally marked with small sub-circular black spots. The fins being uniformly olivaceous or greyish.

Plate XVI, fig. 1 represents *Pimelodus affinis*, somewhat reduced in size; fig. 2, is an outline of the same fish seen from above; and, fig. 3, the head seen from beneath.

Plate XVII illustrates three stages of growth of the same species, showing the constancy of its specific characters, and particularly interesting as compared to the following species figured on Plate XVIII.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
837	10	Adult..	Mouth of Rio Grande del Norte....	1854	Maj. Emory.....	Alcoholic.	Jno. H. Clark....
838	7	...do...	Brownsville, Texas.....	1851	Capt. Van Vliet....	....do....	Capt. Van Vliet..

2. PIMELODUS VULPES, Grd.

Plate XVIII.

Spec. Char.—In its general aspect this species resembles the preceding one, from which it differs chiefly by a shorter and deeper anal fin, smaller spines at the anterior margin of the dorsal and pectorals, and, perhaps, a caudal less deeply furcated. The ventrals are rather short and broad, being also inserted further apart from the origin of the anal, since their posterior extremity extends to the anterior edge of the latter fin and no further. The posterior extremity of the adipose fin is nearly even with the terminus of the anal. The head enters about five times in the total length; the mouth being larger than in *P. affinis*.

The color of the dorsal region is of a greyish black or slate hue, somewhat lighter on the flanks and beneath. Small, sub-circular, black spots may sometimes be observed scattered over the body. The fins, as usual, being unicolor.

D I, 6; A 23; C 5, 1, 8, 7, 1, 6; V 8; P 1, 8.

Plate XVIII represents various stages of growth of *Pimelodus vulpes*, size of life.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig. No.	Nature of specimens.	Collected by—
843	2	.....	Live Oak creek, Texas.....	1854	Major Emory.....	90	Alcoholic.	Dr. C. B. Kennerly.
844	1	.....	Camanche Spring, Texas.....	1851	Col. J. D. Graham..	.....	....do....	John H. Clark....
845	6	.....	Rio Leona: Nueces, Texas....	1851	.....do.....	.....	....do.....	.....do.....
846	4	.....	Piedra Painte, Texas.....	1851	.....do.....	.....	....do....	.....do.....
847	1	.....	Devil's river, Texas	1851	.....do.....	.....	....do.....	.....do.....
848	1	Young	Camanche Spring, Texas.....	1851	.....do.....	.....	....do.....	.....do.....
849	2	.....	Rio Salado, Texas.....	1851	.....do.....	.....	....do.....	.....do.....

Family CYPRINIDAE.

ICTIOBUS TUMIDUS, Grd.

PLATE XIX, FIGS. 1—4.

SPEC. CHAR.—Head constituting about the fifth of the total length. Snout sub-conical. Mouth very small and prominent; lips small. Eyes very large, subcircular, their diameter being contained about four times in the length of the side of the head. Anterior margin of dorsal fin nearly equi-distant between the extremity of the snout and the insertion of the caudal. Tips of posterior rays of anal extending as far as the base of the caudal. Extremities of ventral fins reaching the vent; extremities of pectorals extending almost to the base of the ventrals. Caudal fin furcated and equal to the head in length.

SYN.—*Carpiodes tumidus*, B & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 28.
Ictiobus tumidus, GAD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 170.

The scales are nearly as deep as long, exhibiting radiating furrows upon their anterior and posterior sections. Thirteen longitudinal series may be counted upon the line of greatest depth, and from thirty-seven to thirty-eight scales in the lateral line.

D 2, 27; A 2, 9; C 5, 1, 8, 8, 1, 4; V 2, 9; P 16.

The color is light reddish brown above, and yellowish white beneath.

Plate XIX, fig. 1 represents *Ictiobus tumidus*, size of life; fig. 2 is a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
180	6	Near Fort Brown, Texas.....	1853	Major Emory	Alcoholic..	John H. Clark.....

1. MOXOSTOMA KENNERLII, Grd.

PLATE XX, FIGS. 7—9.

SPEC. CHAR.—In its general physiognomy this species resembles *M. oblongum*, more than any other of its genus. The greatest depth, taken immediately in advance of the dorsal fin, does not enter quite four times and a half in the total length. The head forms a little less than the fifth of that same length. The lower lip is rather broad and very little emarginated, whilst in *M. claviformis* it is very thin and quite sub-divided. The anterior margin of the dorsal is much nearer the tip of the snout than the insertion of the caudal; the upper margin of that fin is sub-convex and as long as high, whilst in *M. claviformis* the height is much greater than the length. The caudal is deeply concave posteriorly; the anal is deep and narrow, its extremity extending, as usual in the genus, to the base of the caudal. The ventrals have pretty much the same position as in *M. claviformis*.

SYN.—*Moxostoma kennerlii*, GAD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 171.

The anterior two rays, in both the dorsal and anal fins, are mere rudiments; also the anterior one in the ventral fins. The scales are not quite so long as in *M. claviformis*.

D 2, 12; A 2, 8; C 4, 1, 8, 8, 1, 3; V 1, 9; P 13.

Plate XX, fig. 7 represents *Moxostoma kennerlii*, size of life; fig. 8 is a scale from the dorsal region; and, fig. 9, a scale from the abdominal region.

List of specimens.

Catal. No	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
161	2735	7	Adult.	Dry creek, near Victoria, Texas.	1854	Major Emory.	Alcoholic	Dr. C. B. Kennerly.

2. MOXOSTOMA VICTORIAE, Grd.

Plate XX, Figs. 1—3.

Spec. Char.—Body elongated, fusiform, reminding us, by its general appearance, of certain species of Mullet (*Mugil*). The greatest depth is nearly equal to the length of the head, which constitutes the fifth of the entire length, the lobes of the caudal fin excepted. The dorsal fin is higher than long, and its anterior margin is situated nearer the tip of the snout than the insertion of the caudal fin. The latter is furcated.

Syn.—*Moxostoma victoriae*, Gird. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 171.

The sub-opercle is well developed; the eye is sub-circular, its diameter being contained four times and a half in the length of the side of the head. The snout is rather pointed, sub-conical, and the mouth, which is small, placed entirely in advance of the orbit.

D 14; A 10; C 6, 1, 8, 8, 1, 5; V 9; P 17.

Twelve longitudinal rows of scales may be counted upon the greatest depth. The scales upon the dorsal and lateral regions are provided with a black dot or spot upon the anterior part of the exposed portion of the scale. Greatest length of specimens observed, six inches and a half.

Plate XX, fig. 1 represents *Moxostoma victoriae*, size of life; fig. 2 is a scale from the dorsal region; and, fig. 3, a scale from the abdominal region.

List of specimen.

Catalogue number.	No. of specimen.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
164	2	Dry creek, near Victoria, Texas.	1854	Major Emory	Alcoholic.	Dr. C. B. Kennerly.

3. MOXOSTOMA CAMPBELLI, Grd.

Plate XX, Figs. 4—6.

Spec. Char.—Body sub-fusiform and elongated like the preceding species, which it resembles in its general outline, and in the proportions of the head and depth of the body towards the total length. The snout is likewise pointed and sub-conical, but the eye is much larger, and the sub-opercle very exiguously developed. The position and shape of the fins do not differ materially from the preceding species, with the exception of the caudal, which is concave posteriorly instead of being furcated.

Syn.—*Moxostoma campbelli*, Gird. in Proc. Acad Nat. Sc. Philad. VIII, 1856, 172.

The scales are smaller than in *M. kennerlii;* thirteen rows instead of twelve are to be observed upon the region of the greatest depth of the body.

D 15; A 10; C 5, 1, 8, 8, 1, 5; V 9; P 15.

Plate XX, fig. 4 represents *Moxostoma campbelli*, size of life; fig 5 is a scale from the dorsal region; and, fig. 6, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
162	1	Devil's river, Texas.....	1851	Col. J. D. Graham.	Alcoholic...	John H. Clark....
163	2	Live Oak creek, Texas.....	1854	Major Emory	....do.....	A. H. Campbell...

1. PTYCHOSTOMUS CONGESTUS, Grd.

Plate XXI, Figs. 5—8.

Spec. Char.—The head is contained five times and a half in the total length. The snout is blunt, abruptly truncated, and the mouth very small. The eyes are large, sub-elliptical, and their longitudinal diameter contained four times in the length of the head from the tip of snout to posterior margin of opercular apparatus. The dorsal fin is sub-quadrangular, its anterior margin being nearer the tip of snout than the base of caudal. The caudal itself is semi-lunar, with its lobes rounded. The anal is narrow; its length is less than half its height. The ventrals are inserted under the middle of the dorsal. The tip of the pectorals does not reach the base of the ventrals.

Syn.—*Catostomus congestus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 27.
Ptychostomus congestus, Gad. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 172.

The scales are large; there are fourteen rows across the line of the greatest depth of the body. The lateral line, which runs straight along the middle of the side, contains about forty-six scales.

D 2, 12; A 1 7 or 8; C 4, 1, 8, 8, 1, 3; V 9; P 17.

The color, as preserved in alcohol, is uniform reddish brown above, lighter beneath; sides silvery. The fins are unicolor, and of the tint of the region to which they belong.

Plate XXI, fig. 5 represents *Ptychostomus congestus*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor'g No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
171	2760	2	Rio Salado, Texas.....	1851	Col. J. D. Graham.	Alcoholic...	John H. Clark....

2. PTYCHOSTOMUS ALBIDUS, Grd.

Plate XIX, Figs. 5—8.

The general physiognomy of this species reminds us of *P. congestus*, although the body is more slender, the head more elongated, and the caudal fin more deeply furcated. The mouth is a great deal larger; whilst the scales, which are longer than deep, are smaller than in the species just alluded to. The ventral fins are missing upon the specimens before us; their insertion alone could be observed. The anal is quite narrow and slender. The color is greyish white above, and greyish silver beneath.

Syn.—*Ptychostomus albidus*, Gad. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 172.

Plate XIX, fig. 5 represents *Ptychostomus albidus*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimens	Collected by—
170	2	Rio San Juan, near Monterey, New Leon.....	1853	Lt. D. N. Couch..	Alcoholic...	Lieut. Couch.....

MINOMUS, Girard.

Gen. Char.—Body elongated and fusiform. Head longer than deep, dorsal fin either higher than long, or with both dimensions equal. The lips being tuberculated, moderately bilobed. The pharyngeals not expanded laterally, but considerably bent inwardly. The teeth compressed, decidedly bicuspid, but the inner projection more developed than the outer. The scales being nearly of the same size, though slightly smaller anteriorly than posteriorly. They are sub-elliptical, longer than deep, with radiating furrows upon the anterior and posterior sections; else all around.

Syn.—*Minomus*, Gird. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 173.

1. MINOMUS INSIGNIS, Grd.

Plate XXI, Figs. 1—4.

Spec. Char.—Body sub-fusiform, elongated, compressed. Head forming two-ninths of the total length. Mouth of medium size, surrounded with considerably developed lips. Eyes large, sub-elliptical; their longitudinal diameter contained almost six times in the length of the side of head. The dorsal fin is sub-quadrangular; its anterior margin is situated midway between the snout and the base of caudal fin. The latter is posteriorly furcated, with its angles sub-acute. The anal is quite narrow and elongated; its base enters three times in the length of its anterior margin. The ventrals are inserted under the posterior half of the dorsal; their posterior extremity does not reach the vent. The pectorals are elongated, their tips not extending as far back as the anterior margin of the dorsal.

Syn.—*Catostomus insignis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 28.
Minomus insignis, Gird. in Proc. Acad. Nat. Sc. Philad. VIII. 1856, 173.

The scales are large; there are twenty rows of them between the base of the ventrals and the dorsal line. The lateral line takes a straight course along the middle of the sides, and is composed of about sixty scales.

D 2 11; A 2, 7 or 8; C 3, 1, 8, 8, 1, 3; V 10; P 18.

The color, as preserved in alcohol, is dark reddish brown above and on the sides, lighter beneath. There is a black dot at the base of each scale, giving a dotted appearance to the body. The fins are unicolor.

Plate XXI, fig. 1 represents *Minomus insignis*, size of life; fig. 2 is a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by -
169	2738	4	Adult	Rio San Pedro, tributary of Rio Gila.	1851	Col. J. D. Graham	Alcoholic.	John H. Clark.

2. MINOMUS PLEBEIUS, Grd.

Plate XXII, Figs. 1—4.

Spec. Char.—Body sub-fusiform, compressed. Head elongated, sub-conical, forming the fifth of the entire length. Mouth of medium size. Eyes large, sub-elliptical, their longitudinal diameter being contained about five times in the length of side of head. Dorsal fin sub-quadrangular, its anterior margin being equidistant between the tip of snout and the first rudimentary rays at the upper lobe of the caudal. The latter is slightly concave posteriorly, and the lobes rounded off. The base of the anal is contained nearly three times in its height, and when brought backwards its tip extends to the rudimentary rays at the inferior lobe of the caudal fin. The ventrals are inserted under the posterior third of the dorsal; bent backwards, their tip does not reach as far as the anus. The pectorals are of medium development, sub-ovate, posteriorly acute.

Syn.—*Catostomus plebeius*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 28.
Minomus plebeius, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 173.

The scales are of medium size, considerably the largest on the peduncle of the tail. Twenty-eight to thirty rows from the base of the ventrals to the dorsal fin. About eighty in the lateral line, which is not discernible as far as the base of caudal fin.

D 1, 9 or 10; A 1, 7; C 3, 1, 8, 8, 1, 2; V 8; P 14.

The color, as preserved in alcohol, is dark brown on the upper regions, faintly mottled with blackish patches. The sides and belly exhibit traces of orange in some of the specimens, in others it is pale yellowish. The fins are unicolor; the dorsal, caudal, and pectorals, blackish brown; the anals and ventrals, yellowish.

Plate XXII, fig. 1 represents *Minomus plebeius*, size of life; fig. 2 is a scale from the dorsal region; fig. 3, scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
168	2737	8	Adult	Rio Mimbres, tributary of Lake Guzman.	1851	Col. J. D. Graham	Alcoholic	John H. Clark.....

3. MINOMUS CLARKI, Grd.

Plate XXII, Figs. 5—8.

Spec. Char.—A rather small and short species, in shape sub-fusiform and compressed. The dorsal line is gently arched. Head small, sub-conical, truncated anteriorly, forming a little less than the sixth of the total length. The eyes are sub-circular, of medium size, their diameter being contained about four times in the length of the side of the head. The upper margin of dorsal fin is slightly concave; its anterior margin as high as long. The caudal is sub-crescentric posteriorly, with rounded lobes. The base of the anal is narrow; its height is twice and a half the width. The insertion of the ventrals is under the posterior third of the dorsal. The pectorals are elongated and of medium development.

Syn.—*Catostomus clarkii*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 27.
Minomus clarkii, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 173.

The scales are rather large, about twenty rows on a cross line from base of ventrals to anterior margin of dorsal. Sixty-eight to seventy scales in the lateral line, which extends to caudal fin.

D 2, 11 or 12; A 2, 7; C 5, 1, 8, 8, 1, 4; V 10; P 17.

Colors in alcohol: greyish brown above, with scattered darker nebulous spots; sides greyish; belly whitish; fins unicolor, vertical ones greyish; horizontal ones yellowish.

Plate XXII, fig. 5 represents *Minomus clarki*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
166	.....	4	Young.	Rio Santa Cruz, or Sonoito	1851	Col. J. D. Graham	Alcoholic	John H. Clark....
167	2736	4	Adult..	Rio Sonoito.....	1851	.....do.....	....do....	

1. ACOMUS LATIPINNIS, Grd.

Plate XXIV, Figs. 1—6.

Spec. Char.—General aspect sub-fusiform. Head proportionally small, and contained about five times and a-half in the total length. Eyes small, situated near the upper surface of the head. Mouth small, also, the lips being large and fleshy. The fins are all very much developed, constituting a prominent specific feature. The upper margin of the dorsal is slightly concave, and the posterior margin of the caudal crescent-shaped; the anal, ventrals, and pectorals being exteriorly rounded or lanceolated.

Syn.—*Catostomus latipinnis*, B & G., in Proc. Acad. Nat. Sc. Philad. VI, 1853, 388.
Acomus latipinnis, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 173.

The scales are of medium size, sub-elliptical, longer than deep, and considerably smaller on the back than on the sides and on the abdomen. The lateral line runs along the middle of the flanks from the opercle to the base of the caudal fin.

D 1, 14; A 2, 8; C 5, 1, 8, 8, 1, 6; V 10; P 18.

The upper part of the body is reddish brown; the upper part of the tail and the flanks are greenish brown; the abdomen being yellowish orange. The caudal fin is olive; the anal, ventrals, and pectorals exhibit traces of deep orange, especially on their outer margin.

Plate XXIV, fig. 1 represents *Acomus latipinnis*, somewhat reduced in size; fig. 2 is the head from beneath, to show the mouth and lips; fig. 3, the head from above; fig. 4, a scale from the dorsal region; fig. 5, a scale from the lateral line; and, fig. 6, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
254	2893	2	Adult.	Rio San Pedro, tributary of the Rio Gila.	1851	Col. J. D. Graham	Alcoholic.	John H. Clark .....
255	.....	2	.....	.....do.....	1851	.....do.....	...do...	.....do.....

2. ACOMUS GUZMANIENSIS, Grd.

Plate XXIII, Figs. 6—10.

Spec. Char.—The head forms the fifth of the total length; its shape is sub-quadrangular, sub-pyramidal. The eyes are small and circular. The lips are well developed and covered with large papillæ, but the posterior one is less indented than in *A. latipinnis*. It has the general physiognomy of *A. latipinnis*, owing to the great development of its fins. It is, however, very readily distinguished from the latter by the presence of much larger scales, especially upon the dorsal region. In shape, the scales are similar to those of *A. latipinnis*, being elliptical, somewhat longer than deep, but the radiating furrows are more numerous.

Syn.—*Catostomus* (*Acomus*) *guzmaniensis*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 173.

The anterior two rays, in both the dorsal and anal fins, are rudimentary; so also the exterior one in the ventrals. The upper regions are purplish black, with an orange lateral band from head to tail, the inferior regions being yellowish white.

D 2, 13; A 2, 7; C 4, 1, 8, 8, 1, 4,; V 1, 9; P 19.

Plate XXIII, fig. 6 represents *Acomus guzmaniensis*, size of life; fig. 7 exhibiting the mouth and lips; fig. 8, a dorsal scale; fig. 9, a scale from the lateral line; and, fig. 10, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
260	2		Janos River, trib. of Lake Guzman, Chih'a.	1854	Maj. Emory.....	Alcoholic.	Dr. C. B. Kennerly...

CATOSTOMUS BERNARDINI, Grd.

Plate XXIII, Figs. 1—5.

Spec. Char.—A specimen of seven inches and a-half, slender and graceful; the head forming somewhat less than the fifth of the total length. The eye is large and sub-circular; its horizontal diameter entering a little over four times in the length of the side of the head. The upper margin of the dorsal is sub-convex, the tips of its posterior rays reaching a vertical line which would intersect the anus. The caudal is sub-crescentic posteriorly. The ventrals and pectorals are well developed.

Syn.—*Catostomus bernardini*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 175.

The scales are elongated, somewhat irregular upon their anterior and posterior edges, and exhibit radiating furrows upon both the anterior and posterior sections, and apparently more numerous upon the former section than upon the latter.

D 15; A 10; C 5, 1, 8, 8, 1, 5; V 10; P 16.

The color is uniform purplish black above, and yellowish white beneath.

Plate XXIII, fig. 1 represents *Catostomus bernardini*, size of life; fig. 2 exhibiting the mouth and lips; fig. 3, a dorsal scale; fig. 4, a scale from the lateral line; and, fig. 5, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
174	1		San Bernandino, in an affluent of the Rio Huagui, west of the Sierra Madre, Mex.	1854	Maj. Emory.....	Alcoholic.	Dr. C. B. Kennerly ...

CAMPOSTOMA, Agass.

Gen. Char.—Head sub-conical; body sub-fusiform: both compressed. Snout obtuse and protractile. Mouth inferior, though its gape is horizontal. Lips very conspicuously developed; no barbels or cirrhi. Eyes of moderate development; isthmus very wide. Origin of ventrals situated in advance of the anterior margin of the dorsal. Caudal furcated. Scales of dorsal region deeper than long; of the abdominal region longer than deep, with radiating furrows upon the posterior section or posterior half. Pharyngeal bones strongly curved, with a small dilatation upon their convexity. Teeth of the cultriform kind, of the grinding type, occasionally somewhat hooked. They are disposed upon a single row of four, or else upon a double row of four and one, in the following manner: 4—4, or 1 | 4—4 | 1.

Syn.—*Campostoma*, Agass. in Amer. Journ. of Sc. and Arts, 2d ser. XIX, 1855, 219.—Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 176.

1. CAMPOSTOMA ORNATUM, Grd.

Plate XXV, Figs. 1—4.

Spec. Char.—It is larger, more elongated, and more fusiform than *C. anomalum*. The head enters four times and a half in the total length. The diameter of the eye enters nearly six times in the length of the side of the head The scales are much smaller than in *C. anomalum*; they are sub-circular, rather deeper than long, with radiating furrows upon their posterior half.

Syn.—*Campostoma ornatum*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 176.

The upper regions are purplish black; the inferior regions golden brown and yellow, with black spots scattered over the flanks. A black patch at the base of all the fins, otherwise the latter are orange or yellowish brown.

D 2, 8; A 2, 8; C 7, 1, 9, 8, 1, 6; V 8; P 16.

Plate XXV, fig. 1, represents *Campostoma ornatum*, size of life; fig. 2 is a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
77	2682	4	Adult.	Chihuahua river & trib's.	1855	Jno. Potts, Esq....	Alcoholic.	Jno. Potts, Esq.....

2. CAMPOSTOMA FORMOSULUM, Grd.

Plate XXV, Figs. 5—8.

Spec. Char.—The head is a little less than the fifth of the total length, and so also is the caudal fin. It resembles more *C. anomalum* than *C. ornatum*; the most conspicuous difference consists in the presence of larger scales, the posterior margin of which being scalloped. The radiating furrows are very conspicuous, occupying the posterior section of the scale only.

Syn.—*Campostoma formosulum*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 176.

The ground color of the dorsal region is dark purple, with scattered black irregular spots; beneath yellowish brown. The dorsal fin and the base of the caudal exhibiting a black patch.

Plate XXV, fig. 5, represents *Campostoma formosulum*, size of life; fig. 6, a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdominal region.

List of specimens.

Catal No.	Cor No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained	Orig'l No.	Nature of specimen.	Collected by—
76	2681	15	Adult.	Rio Sabinal, trib. of Rio San Antonio, Texas.	1854	Major Emory...	116 117 118	Alcoholic.	Dr C. B. Kennerly.

3. CAMPOSTOMA NASUTUM, Grd.

PLATE XXV, FIGS. 9—12.

SPEC. CHAR.—It is a short and rather compact species, with the peduncle of the tail rather tapering. Its most prominent character consists in its thick and protruding snout, which overlaps the lower jaw more than in the species above referred to. The head enters four times and a half in the total length. The scales are proportionally larger than in any of the known species of this genus.

SYN.— *Campostoma nasutum*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 176.

The ground color is greyish above, and whitish or yellowish beneath; upper region of body and flanks occasionally marmorated. A black patch at the base of the caudal and dorsal fins.

Plate XXV, fig. 9, represents *Campostoma nasutum*, size of life; fig. 10 is a scale from the dorsal region; fig. 11, a scale from the lateral line; and, fig. 12, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
75	2680	10	Cadereita, New Leon	1853	Lt. D. N. Couch..	Alcoholic.	Lt. D. N. Couch.....
74	2679	4	Acapulco, New Leon, Mex..	1853	.....do	...do.....	.....do.....

1. DIONDA SERENA, Grd.

PLATE XXVI, FIGS. 9—12.

SPEC. CHAR.—Its form is slender and elongated, the dorsal outline being nearly straight; the head enters five times and a half in the total length. The eye is large and circular; its diameter entering only three times in the length of the side of the head. The insertion of the ventrals takes place immediately opposite the anterior margin of the dorsal fin. The pectorals are long and slender, even more so than in *D. episcopa*.

SYN.—*Dionda serena*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 177.

The dorsal region is light brown, the flanks and abdomen being silvery, with the scales of the lateral line dotted with black, imitating spots. A black spot at the base of the caudal fin.

D 1, 8; A 2, 7; C 4, 1, 9, 8, 1, 3; V 8; P 13.

Plate XXVI, fig. 9, represents *Dionda serena*, size of life; fig. 10 is a scale from the dorsal region; fig. 11, a scale from the lateral line; and, fig. 12, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
43	2656	10	Rio Sabinal, Texas.....	1854	Major Emory....	Alcoholic.	Dr. C. B. Kennerly.....

2. DIONDA TEXENSIS, Grd.

PLATE XXVI, FIGS. 21—24.

SPEC. CHAR.—Is a very characteristic species. The body is rather deep upon its middle, and the lateral line somewhat deflexed. The head is quite small and sub-conical, entering five times and a half in the total length. The eye is large and circular. The insertion of the ventral fin is placed a little posteriorly to the anterior margin of the dorsal. The dorsal region is greyish brown; the abdominal region greyish white; a diffused greyish black band may be observed along the middle of the flanks, embracing the lateral line beneath, and a black spot at the base of the caudal. The ventrals and pectorals are yellow.

SYN.—*Dionda texensis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 177.

Plate XXVI, fig. 21, represents *Dionda texensis*, size of life; fig. 22 is a scale from the dorsal region; fig. 23, a scale from the lateral line; and, fig. 24, a scale from the abdominal region.

List of specimens.

Catalogue No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
44	2657	30	Rio Nueces, Texas.....	1851	Col. J. D. Graham.	Alcoholic.	Jno. H. Clark.....

3. DIONDA ARGENTOSA, Grd.

PLATE XXVI, FIGS. 5—8.

SPEC. CHAR.—Has a small head and an obtuse snout, a rather slender and compressed body. The head constitutes two-elevenths of the total length. The insertion of the ventrals is situated opposite the anterior margin of the dorsal. The scales being quite large, the lateral line is slightly deflected upon the thoracic region. Color of the dorsal region reddish brown; sides and abdomen as if painted over with silver or quicksilver. Fins olivaceous.

SYN.—*Dionda argentosa*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 178.

Plate XXVI, fig. 5, represents *Dionda argentosa*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen	Collected by—
32	2646	10	San Felipe creek, Tex.	1851	Col. J. D. Graham	Alcoholic.....	John H. Clark...
33	2647	4	Devil's river, Texas	1851	.....do.....	....do.....	.....do.....

4. DIONDA CHRYSITIS, Grd.

PLATE XXVI, FIGS. 13—16.

SPEC. CHAR.—Very slender and compressed; head very small and obtuse, contained six times in the total length. Eyes large and circular. Origin of ventrals opposite the anterior margin of dorsal. Upper surface of head tuberculous. Scales large. Dorsal region reddish brown; sides and abdomen as if painted with gold. A black spot upon the base of the caudal fin. Fins themselves yellowish or olivaceous.

SYN.—*Dionda chrysitis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 178.

Plate XXVI, fig. 13, represents *Dionda chrysitis*, size of life; fig. 14, a scale from the dorsal region; fig. 15, a scale from the lateral line; and, fig. 16, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
37	2651	20	Live Oak creek, Texas..	1851	Col. J. D. Graham.	Alcoholic ..	John H. Clark.....

5. DIONDA MELANOPS, Grd.

Plate XXVI, Figs. 17—20.

Spec. Char.—A rather short and deep body characterizes this species. The head is proportionally well developed, forming less than the fifth of the total length. The snout is conical and not abruptly truncated. The insertion of the ventrals is situated somewhat posteriorly to the anterior margin of the dorsal. Scales large. The dorsal region is blackish; the sides and abdomen are dotted with black upon a bluish lead ground, giving the whole fish a dark appearance. A black spot upon the base of the caudal fin.

Syn.—*Dionda melanops*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 178.

Plate XXVI, fig. 17, represents *Dionda melanops*, size of life; fig. 18 is a scale from the dorsal region; fig. 19, a scale from the lateral line; fig. 20, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
38	2652	5	Buena Vista, Coahuila.....	1853	Lieut. D. N. Couch...	Alcoholic ..	Lieut. Couch.....

6. DIONDA COUCHI, Grd.

Plate XXVI, Figs. 1—4.

Spec. Char.—Though closely allied to the preceding, it may readily be distinguished from it by a more elongated body and more elongated head. The snout is rounded. The eye is circular and of medium size. The ventrals are inserted posterior to the anterior margin of the dorsal. The scales are quite large. Upper regions greyish black, sides and abdomen yellowish or whitish, either unicolor or maculated. A black spot upon the base of the caudal.

Syn.—*Dionda couchi*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 178.

Plate XXVI, fig. 1, represents *Dionda couchi*, size of life; fig. 2, a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
40	.....	4	Guajuco, New Leon.....	1853	Lieut. D. N. Couch...	Alcoholic ..	Lieut. Couch.....
41	2654	5	Monterey, N. L.....	1853	.....do.....	....do.....	.....do.....
42	2655	4	Cadereita, N. L.....	1853	.....do.....	....do.....	.....do.....

ALGOMA, Girard.

Gen. Char.—Partakes, in a measure, of the characters of *Hyborhynchus* and *Pimephales*. The teeth are of the cultriform kind, of the grinding type, disposed upon a single row of four: 4—4. The grinding surface is nearly linear, in which respect the teeth resemble more those of *Pimephales* than of *Hyborhynchus*. The pharyngeal bones do not differ materially in these genera. The head is small and sub-truncated, the mouth small, with the lower jaw shortest, and overlapped by the upper, a feature also noticed in *Hyborhynchus*. The isthmus is of a moderate size; the eye well developed. The insertion of the ventrals takes place posterior to the anterior margin of the dorsal. The latter is higher than long, without a short and thick ray anteriorly. The anal is shaped like the dorsal. The caudal is furcated. The scales are large, and deeper than long, furrowed upon the posterior section only; the lateral line sub-median, is slightly deflexed upon the abdomen.

Syn.—*Algoma*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 180.

The large scales will serve to distinguish, upon a first glimpse, this genus from both *Hyborhynchus* and *Pimephales*.

1. ALGOMA AMARA, Grd.

PLATE XXVII, FIGS. 17—20.

SPEC. CHAR.—Head constituting about the fifth of the total length. Ten rows of scales upon the line of greatest depth, five above the lateral line and four beneath it. The upper surface of the head and nape is flattened, as in *Hydrargyra* and *Fundulus*.

SYN.—*Algoma amara*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 180.

The dorsal region is of a pale red, the sides are silvery, whilst the abdomen is whitish.

D 1, 8; A 2, 8; C 7, 1, 9, 8, 1, 6; V 8; P 15 or 16.

Plate XXVII, fig. 17, represents *Algoma amara*, size of life; fig. 18 is a scale from the dorsal region; fig. 19, a scale from the lateral line; and, fig. 20, a scale from the abdominal region.

List of specimens.

Catal No.	Cor. No of teeth	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
149	2727	1	Laguna, near Fort Brown, Tex.	1853	Maj. Emory.....	Alcoholic.	Jno. H. Clark.....

2. ALGOMA FLUVIATILIS, Grd.

PLATE XXVII, FIGS. 13—16.

SPEC. CHAR.—This species has the general aspect of a young *Campostoma*, and might easily be taken as such. Its mouth and eye are smaller than in the preceding species. The upper lobe of the caudal is longer than the lower lobe. There are also ten longitudinal rows of scales upon the line of greatest depth. The upper surface of the head exhibiting numerous small spiny tubercles, as fishes sometimes have during the breeding season.

SYN.—*Algoma fluviatilis*, GRD. in Proc. Acad. Nat. Sc Philad. VIII, 1856, 180.

Color reddish brown above; yellowish brown beneath.

D 1, 8; A 8; C 5, 1, 9, 8, 1, 4; V 8; P 17.

Plate XXVII, fig. 13, represents *Algoma fluviatilis*, size of life; fig. 14 is a scale from the dorsal region; fig. 15, a scale from the lateral line; and, fig. 16, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
148	2726	1	Adult	Near Monterey, New Leon.	1853	Lt. D. N. Couch....	Alcoholic.	Lt. D. N. Couch....

COCHLOGNATHUS, B. & G.

GEN. CHAR.—Under the external aspect of *Pimephales*, it presents that unique peculiarity in the cyprinoid family, of having spoon-shaped bony expansions of the jaws. There is one on each side on the upper as well as on the lower jaw, exactly as in the genus *Tetrodon*; their edge being sharp and cutting. The head is short and the snout very blunt. The dorsal fin has the structure of that of *Pimephales*; the insertion of the ventrals is situated under the anterior margin of the dorsal, the caudal

being furcated. The scales are large, deeper than long, the lateral line following the middle of the flanks. The isthmus is rather wide. The pharyngeals have the same shape and form as in *Pimephales;* the teeth, however, are more slender and concave upon the grinding surface, giving them the appearance of being bent backwards. They are cultriform, of the grinding type, a little more conspicuously hooked, and disposed upon a single row of four: 4—4.

Syn.—*Cochlognathus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 150.—Gad. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 181.

We are acquainted so far with but one species of this genus, referred to hereon.

COCHLOGNATHUS ORNATUS, B. & G.

Plate XXXV, Figs. 12—17.

Spec. Char.—Head forming two-ninths of the entire length; snout abruptly rounded off. Mouth proportionally small, terminal; its gape somewhat oblique. Eyes rather above the medium size; their diameter being contained four times in the length of the side of the head. Body much compressed, covered with large scales disposed upon twelve longitudinal series across the line of greatest depth. Lateral line deflexed downwards upon the abdomen. Anterior margin of dorsal nearly equidistant between the snout and the rudimentary rays of the caudal. Anal situated entirely backwards of the dorsal. Caudal furcated. Insertion of ventrals situated opposite the anterior margin of dorsal; tip of pectoral not reaching them.

Syn.—*Cochlognathus ornatus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 158.—Gad. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 181.

The outline of the scales is quite irregular; they are very much deeper than long, with rather short radiating furrows on their posterior margin only.

D 1, 8; A 6; C 4, 1, 9, 8, 1, 3; V 8; P 12.

The colors, as preserved in alcohol, present a reddish brown ground, and a dark lateral band or stripe. The dorsal fin exhibits two elongated dark spots—one anteriorly and basal, the other posteriorly and nearer to its tip. The posterior half of the caudal has likewise a darker hue than its anterior and basal half, which is of a dull orange, as is also its extreme margin.

Plate XXXV, fig. 12, represents *Cochlognathus ornatus*, size of life; fig. 13 exhibits the jaws in profile, whilst fig. 14 is a front view of the same, the mouth being open; fig. 15 is a dorsal scale; fig. 16, a scale from the lateral line; and, fig. 17, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
150	2728	6	Adult ...	Brownsville, Texas.....	1852	Captain Van Vliet.....	Alcoholic.

ALGANSEA TINCELLA, Grd.

Plate XXVII, Figs. 1—4.

Spec. Char.—The scales in this species are next in size to those of *A. obesa*. There are about twelve rows beneath, and fourteen above, the lateral line. I say about, because the specimens are somewhat mutilated, as most market specimens are. The insertion of the ventrals is situated a little posteriorly to the anterior margin of the dorsal. The eye is smaller than in any of the other known species of this genus.

Syn.—*Leuciscus tincella*, Valenc. in *Cuv. & Val.* Hist. nat. des Poiss. XVII, 1854, 323.
Alganses tincella, Gad. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 183.

The scales are elongated, sub-elliptical, provided with radiating furrows upon their entire periphery.

D 1, 9; A 1, 8; C 6, 1, 9, 8, 1, 5; V 9; P 17.

The color is reddish brown above, silvery on the sides, and whitish beneath.

Plate XXVII, fig. 1, represents *Algansea tincella*, size of life; fig. 2 is a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor'g No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
195	2753	6	Adult..	Near the City of Mexico.	1852	Major Wm. Rich.....	Alcoholic.	Major Wm. Rich...

1. ARGYREUS OSCULUS, Grd.

Plate XXVII, Figs. 9—12.

Spec. Char.—Has more the fascies of *A. stronasus* than of any other of its congeners, both by the outline of its body and head, and the shape and position of the mouth. The head is comparatively small, forming the fifth of the length, with the exception of the fork of the caudal. The eye is rather large and sub-circular, its diameter entering about four times in the length of the side of the head. The dorsal and anal fins are well developed, the former being convex superiorly, and the latter sub-convex exteriorly. The posterior margin of the caudal is crescentic. The posterior extremity of the ventrals extend as far as the vent, which is not the case in *A. dulcis* and *A. nubilis*.

Syn.—*Argyreus osculus*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 186.

The anterior two rays of both the dorsal and anal fins are mere rudiments, as elsewhere stated.

D 2, 8; A 2, 7; C 5, 1, 9, 8, 1, 6; V 8; P 14.

The color is reddish brown above; olivaceous on the sides, with numerous dark blotches and dots. Beneath uniform yellowish white, or silvery white.

Plate XXVII, fig. 9, represents *Argyreus osculus*, size of life; fig. 10 is a scale from the dorsal region; fig. 11, a scale from the lateral line; and, fig. 12, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor'g No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
50	2663	10	Babocomori river, trib. of San Pedro river: Gila.	1851	Col. J. D. Graham....	Alcoholic.	Jno. H. Clark.....

2. ARGYREUS NOTABILIS, Grd.

Plate XXVII, Figs. 5—8.

This species resembles *A. osculus* in many respects, but will always be easily distinguished from it by a more truncated snout, and, consequently, by a mouth not so deeply cleft. The dorsal fin is situated more anteriorly also. The scales are sub-elliptical, elongated, exhibiting some-

times radiating furrows upon the anterior as well as upon the posterior sections; they are proportionally smaller than in *A. oculus*, and somewhat more elongated. The ground color is yellowish brown above, golden or orange beneath, covered all over, the abdominal region excepted, with small black spots.

SYN.—*Argyreus notabilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 186.

Plate XXVII, fig. 5, represents *Argyreus notabilis*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdomina region.

List of specimens.

Catal. No.	Cor'g No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
49	2662	4	Rio Santa Cruz, Sonora.	1851	Col. J. D. Graham ..	Alcoholic.	John H. Clark.....

AGOSIA, Girard.

GEN. CHAR.—Snout rounded, slightly protruding beyond the lower jaw, though the mouth opens horizontally. The mouth is of medium size, surrounded with narrow and smooth lips, and provided upon its angle with a very small barbel. The isthmus is of moderate width. The insertion of ventrals is situated opposite the anterior margin of dorsal fin, which is higher than long. The caudal is furcated. The scales are minute, somewhat longer than deep, with radiating furrows all around. The pharyngeal bones are expanded upon their curvature. The teeth are of the prehensile kind, of the hooked type, provided with a grinding surface, strongly hooked, and disposed thus: 4—4, that is, upon one single row of four.

SYN.—*Agosia*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 186.

Now, comparing the above with the characters assigned elsewhere to *Argyreus*, we find that the most prominent difference resides in the pharyngeal teeth. The isthmus is narrower also, and the insertion of the ventrals placed further backwards.

1. AGOSIA CHRYSOGASTER, Grd.

PLATE XXVIII, FIGS. 5—8.

SPEC. CHAR.—Head forming a little more than the fifth of the total length. The posterior extremity of the maxillary extends to the vertical line of the anterior rim of the orbit. The eye is large and circular; its diameter being contained about four times in the length of the side of the head. The anterior margin of the dorsal is somewhat nearer the extremity of the snout than the insertion of the caudal fin.

SYN.—*Agosia chrysogaster*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 187.

A minute rudimentary ray at the anterior margin of both the dorsal and the anal fins is not included in the following numbers.

D 10; A 7; C 4, 1, 9, 8, 1, 5; V 9; P 16.

The scales are obscurely sub-quadrangular, conspicuously longer than deep, with a proclivity of being deeper posteriorly than anteriorly.

The region above the middle of the flanks is reddish brown, spotted or dotted with black, especially upon the head; a black streak separates this region from that beneath, which is unicolor, of a golden hue.

Plate XXVIII, fig. 5, represents *Agosia chrysogaster*, size of life; fig. 6 being a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor'g No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
81	2684	8	Adult.	Rio Santa Cruz, Sonora..	1851	Col. J. D. Graham....	Alcoholic.	Jno. H. Clark....

2. AGOSIA METALLICA, Grd.

Plate XXVIII, Figs. 1—4.

Spec. Char.—This species is somewhat shorter than the preceding one. It is very characteristic, and easily distinguished from its congener. The head is shorter and the snout more abruptly rounded. The eye is smaller also. The body is more gracefully sub-fusiform and compressed. The dorsal is higher and narrower, rounded superiorly. The posterior margin of the caudal is crescentic, less furcated than in *A. chrysogaster*.

Syn.—*Agosia metallica*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 187.

The formula of the fins' rays present also some differences:

D 9; A 8; C 4, 1, 9, 8, 1, 5; V 8; P 15.

The same is true with regard to the rudiment at the anterior margin of the dorsal and anal fins, and which must be sought for under the skin.

The scales are but slightly longer than deep, rather tapering posteriorly, giving to their outlines a somewhat ovoid appearance.

Upper regions greyish brown, dotted with black; inferiorly silvery and unicolor; a black streak on the sides separating the two tints.

Plate XXVIII, fig. 1, represents *Agosia metallica*, size of life; fig. 2 is a dorsal scale; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
85	2686	8	Adult.	Rio San Pedro, trib. of Gila.	1851	Col. J. D. Graham ...	Alcoholic.	Jno. H. Clark ...

GOBIO AESTIVALIS, Grd.

U. S. P. R. R. Expl. & Surveys—Fishes.—Plate LVII, Figs. 17—29.

Spec. Char.—Head contained about four times and a half in the total length. Differs from *G. gelidus* and *G. vernalis*, its American congeners, by a rather compressed body, elevated and arched upon its middle region and tapering rapidly towards the peduncle of the tail. The snout is more protruding than in *G. gelidus*, the eye larger, and the ventral fins inserted somewhat more forwards.

Syn.—*Gobio aestivalis*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 189.

The scales are also larger, deeper than long, anteriorly sub-truncated and posteriorly rounded, with radiating furrows upon the latter section only.

D 1, 8; A 1, 7; C 3, 1, 6, 5, 1, 4; V 6; P 11.

The color is yellowish brown, somewhat lighter beneath than above, with a silvery streak along the middle of the flanks.

Plate LVII, (U. S. P. R. R. Expl. & Surveys) fig. 17, represents, size of life, *Gobio aestivalis*; fig. 18 is the head seen from beneath, exhibiting the outline of the mouth; fig. 19, a dorsal scale; fig. 20, a scale from the lateral line; and, fig. 21, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.
79	1	Rio San Juan, near Cadereita, New Leon..	1853	Lt. D. N. Couch....	Alcoholic.....

MEDA, Girard

Gen. Char.—Body elongated, slender, compressed, fusiform in its profile, and scaleless. The lateral line may be traced along the middle of the flanks, slightly deflexed upon the abdomen. The head is elongated, sub-conical, rounded upon the snout, without being truncated. The mouth is proportionally large, sub-terminal, its gape slightly oblique upwards, the lower jaw fitting into the upper. No barbels. The eye large and circular. The isthmus narrow. Dorsal fin higher than long, provided anteriorly with a stout, articulated, but simple and osseous ray, grooved posteriorly, and nearly as high as the second ray, which is slightly higher, and the highest of all. The ventrals are inserted in advance of the anterior margin of the dorsal, and adherent to the ventral line for more than the half of their total length. The caudal is deeply furcated. The pharyngeal bones are slender, especially upon their inferior limbs, which are longer than the upper ones. The latter are flattened or expanded, and curved inwardly downwards. The teeth are very slender, sub-conical, compressed at their base, of the prehensile kind, of the hooked type, without grinding surface. They are disposed upon a double series of one and four: 1 | 4—4 | 1. Thus equally distinct from both *Phoxinus* and *Phoxinellus*, to which this genus bears an external resemblance.

Syn.—*Meda*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 191.

The genus here referred to differs widely from all other American cyprinoids by the presence, upon the anterior margin of the dorsal, of a stout undivided (but articulated) ray, resembling in its general appearance that which is observed in *Barbus*, *Luciobarbus*, *Scaphiodon*, and *Systomus*, differing, however, from all of these in the structure of its posterior edge, which is grooved instead of being serrated. The absence of buccal barbels in *Meda* is another feature to warrant its claims as a genus, differing from *Cyprinus*, *Carassius*, *Carpio*, &c., by characters equally obvious.

MEDA FULGIDA, Grd.

Plate XXVIII, Figs. 9 & 10.

Spec. Char.—Head constituting a little more than the fifth of the total length. The angle of the mouth corresponds to a vertical line drawn in advance of the orbit. The broad insertion of the ventrals is equally characteristic.

Syn.—*Meda fulgida*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 192.

The dorsal region is reddish yellow, the middle of the flanks appearing as though painted with silver, whilst the inferior region is of a pale yellow.

D 9; A 1, 11; C 5, 1, 9, 8, 1, 4; V 7; P 15.

Plate XXVIII, fig. 9, is a mere outline of *Meda fulgida*, double the natural size, whilst fig. 10 represents it size of life.

List of specimens.

Catal. No.	Cor. No of teeth	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
154	2730	10	Rio San Pedro, trib of Gila..	1851	Col. J. D. Graham .	Alcoholic ..	Jno. H. Clark ..

CLIOLA VELOX, Grd.

PLATE XXXI, FIGS. 21—24.

SPEC. CHAR.—A very slender and elegant species, differing from *C. vigilax* by a more conical head, much larger eyes, and larger scales. The latter are much deeper than long, with radiating furrows upon the posterior section alone. A black spot may be observed upon the anterior margin of the dorsal fin.

SYN.—*Cliola velox*, GRD. in Proc. Acad. Nat. Sc. Philad VIII, 1856, 192.

The ground color is olivaceous, with the middle of the flanks silvery; a black streak follows the course of the lateral line. A black spot exists also upon the base of the caudal fin.

Plate XXXI, fig. 21, represents *Cliola velox*, size of life; fig. 22 is a scale from the dorsal region; fig. 23, a scale from the lateral line; and, fig. 24, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
29	2643	2	San Pedro creek, tributary of Rio San Antonio, Texas.	1854	Major Emory.....	Alcoholic.	Dr. C. B. Kennerly.

1. ALBURNELLUS AMABILIS, Grd.

PLATE XXIX, FIGS. 10—13.

This is a very slender and graceful species, about two inches and a half in total length. The head constitutes the fifth of the length, and the greatest depth, the sixth.

D 1, 8; A 1, 10; C 3, 1, 9, 8, 1, 2; V 8; P 13.

There are nine longitudinal rows of scales upon the flanks, between the insertion of the ventral fins and the dorsal fin. The lateral line, as usual, follows the fourth row above the ventrals. The color is dark reddish brown, silvery upon the flanks. A black patch upon the base of the tail.

SYN.—*Alburnus amabilis*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 193.

Plate XXIX, fig. 10, represents *Alburnellus amabilis*, size of life; fig. 11 is a scale from the dorsal region; fig. 12, a scale from the lateral line; and, fig. 13, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
72	2677	15	Rio Leona, trib. of Rio Nueces, Tex..	1851	Col. J. D. Graham..	Alcoholic.	John H. Clark..

2. ALBURNELLUS MEGALOPS, Grd.

PLATE XXIX, FIGS. 1—4.

Resembles *A. amabilis* in general traits, being slender and graceful, but easily distinguished from it by a shorter and more rounded snout and a larger eye. The coloration is the same, with the exception of the black caudal patch, which does not exist here. The average size of the specimens before us is about two inches in total length.

SYN.—*Alburnus megalops*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 193.

Plate XXIX, fig. 1, represents *Alburnellus megalops*, size of life; fig. 2 is a dorsal scale; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
69	20	San Felipe creek, Texas.....	1851	Col. J. D. Graham.....	Alcoholic.	John H. Clark.....

3. ALBURNELLUS SOCIUS, Grd.

PLATE XXIX, FIGS. 14—17.

Resembles *A. megalops* by its snout and eye. The total length is two inches and three-quarters, the head forming the fifth part of it. The greatest depth is a little less than the length of the head. The dorsal region is olivaceous, the flanks silvery, and the belly yellowish. Opercular apparatus golden.

SYN.—*Alburnus socius*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 193.

Plate XXIX, fig. 14, represents *Alburnellus socius*, size of life; fig. 15 is a dorsal scale; fig. 16, a scale from the lateral line; and, fig. 17, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
70	2676	20	Live Oak creek, Texas..	1851	Col. J. D. Graham	Alcoholic.	John H. Clark.....

CODOMA, Girard.

GEN. CHAR.—Head short, snout rounded, terminated by a small mouth, the gape of which does not reach a vertical line drawn in front of the orbit; there being no barbels at its angle, and both jaws even. The isthmus is of moderate width. The body is more or less elongated, compressed. The insertion of the ventrals is situated in advance of the anterior margin of the dorsal. The caudal is furcated, and, like the rest of the fins, rather small. The scales are of medium size, higher than long, with radiating furrows upon their posterior section only, and the lateral line is but slightly deflexed upon the thoracic region. The pharyngeals are moderately expanded upon their convexity. The teeth are of the raptatorial kind, of the hooked type, compressed, without grinding surface, instead of which, a sharp but not serrated ridge. They are arranged upon one single row of four, thus: 4—4.

SYN.—*Codoma*, GRD. Proc. in Acad. Nat. Sc. Philad. VIII, 1856, 194.

The general physiognomy of the genus reminds us of those of *Pimephales* and *Cochlognathus*, with which genera it has no intimate affinities, when the pharyngeal dentition is taken into consideration. Indeed, its affinities with *Cyprinella* and *Moniana* are of a more close character, for, the teeth are constructed upon the same general pattern; from *Cyprinella*, however, it differs by the presence of one single row of teeth, and from *Moniana* by the absence of serratures upon the cutting edge of the teeth, and finally from both *Cyprinella* and *Moniana* by smaller scales, the course of the lateral line, and the short and rounded head.

1. CODOMA ORNATA, Grd.

PLATE XXIX, FIGS. 22—25.

SPEC. CHAR.—The head, which is short and rounded off, forms the fifth of the total length, whilst the greatest depth enters in the latter but three times and a half. The eye is circular and well developed; its diameter entering somewhat more than three times in the length of the side of the head. The anterior margin of the dorsal is a little nearer the extremity of the snout than the insertion of the caudal fin.

SYN.—*Codoma ornata*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 195.

The coloration is rich and profuse, the upper regions are purplish black, with transverse bands of the same hue from the head to the base of the caudal fin; the space not occupied by these, on the back as well as on the abdomen, is of a golden orange red. The fins are purplish black, edged or tipped with golden yellow or pure white.

D 1, 8; A 1, 7; C 6, 1, 9, 8, 1, 6; V 7; P 12.

Plate XXIX, fig. 22, represents *Codoma ornata*, size of life; fig. 23 is a scale from the dorsal region, fig. 24, a scale from the lateral line; and, fig. 25, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
91	2691	4	Adult.	Chihuahua river and tributaries.....	1855	Jno. Potts, Esq.	Alcoholic.	Jno. Potts, Esq.

2. CODOMA VITTATA, Grd.

PLATE XXIX, FIGS. 18—21.

SPEC. CHAR.—Has a more elongated body and sub-fusiform outline than the preceding species. The head forms a little less than the fifth of the entire length, whilst the depth enters in it about four times and a half. The eye is much smaller than in *C. ornata*; the fins and scales are smaller also.

SYN.—*Codoma vittata*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 195.

The upper regions are purplish brown; a silvery band along the middle of the flank; inferiorly yellowish orange. Fins unicolor; the superior ones greyish, the inferior yellowish.

D 1, 8; A 2, 7; C 7, 1, 9, 8, 1, 6; V 7; P 14.

Plate XXIX, fig. 18, represents *Codoma vittata*, size of life; fig. 19 is a dorsal scale; fig. 20, a scale from the lateral line; and, fig. 21, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	A e.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
92	2692	10	Adult.	Valley of Mexico.....	1855	Jno. Potts, Esq ..	Alcoholic ...	Jno. Potts, Esq ..

1. CYPRINELLA MACROSTOMA, Grd.

PLATE XXXI, FIGS. 5—8.

This species is very characteristic. The body is deep upon its middle, tapering posteriorly. The head is sub-conical, with a prominent snout and a very large mouth. The eye is well developed. The ventrals are inserted somewhat in advance of the anterior margin of the dorsal fin. The ground color is reddish, with a silvery streak along the middle of the flank, extending likewise over the opercular apparatus.

SYN.—*Cyprinella macrostoma*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 198.

Plate XXXI, fig. 5, represents *Cyprinella macrostoma*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; and, fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
129	.....	3	Adult.	Devil's river, Texas..	1851	Col. J. D. Graham....	Alcoholic.	John H. Clark.....
130	2711	3	.....	China, New Leon.....	1853	Lt. D. N. Couch	....do....	Lt. D. N. Couch.....

2. CYPRINELLA VENUSTA, Grd.

PLATE XXXI, FIGS. 1—4.

Gracefully compressed and fusiform in profile. The snout protruding and sub-conical. The species is related to *C. macrostoma*, from which it chiefly differs by the relative size of its mouth and shape of the body. The ventrals are likewise inserted somewhat in advance of the anterior margin of the dorsal. Greyish red above, pale beneath; sides silvery. A black patch at the base of the caudal fin.

SYN.—*Cyprinella venusta*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 198.

Plate XXXI, fig. 1, represents *Cyprinella venusta*, size of life; fig. 2 is a dorsal scale; fig. 3, a scale from the dorsal region; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig'l No.	Nature of specimen.	Collected by—
140	2719	15	Adult.	Rio Sabinal, Texas.	1854	Major Emory	119	Alcoholic.	Dr. C. B. Kennerly.

3. CYPRINELLA TEXANA, Grd.

PLATE XXXI, FIGS. 9—12.

Body very slender and fusiform; head small and sub-conical; mouth small; eye large. Ventrals inserted under the anterior margin of the dorsal. Color reddish brown, sides silvery; black dots along the lateral line, terminating into a black spot at the base of the caudal fin.

SYN.—*Cyprinella texana*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 198.

Plate XXXI, fig. 9, represents *Cyprinella texana*, size of life; fig. 10 is a dorsal scale; fig. 11, a scale from the lateral line; and, fig. 12, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
128	2710	9	Rio Salado, Texas.....	1851	Col. J. D. Graham.....	Alcoholic.	John H. Clark .....
127	.....	1	Turkey creek, Texas....	1851	.....do.....	.....do....	.....do.....

4. CYPRINELLA LUXILOIDES, Grd.

PLATE XXXI, FIGS. 13—16.

At first sight this species, in its general aspect, remind us of certain species of *Luxilus:* The body being deep, gradually tapering away forwards and backwards. The head is well developed and the mouth also. Ventrals inserted slightly in advance of the dorsal. The scales are quite narrow and deep. Reddish brown above; silvery beneath.

SYN.—*Cyprinella luxiloides*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 198.

Plate XXXI, fig. 13, represents *Cyprinella luxiloides*, size of life; fig. 14 is a dorsal scale; fig. 15, a scale from the lateral line; and, fig. 16, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Orig. No.	Nature of specimen.	Collected by—
131	2	Adult.	San Pedro creek, trib. of Rio San Antonio, Tex.	1854	Major Emory	108 109	Alcoholic.	Dr. C. B. Kennerly...

1. MONIANA AURATA, Grd.

PLATE XXX, FIGS. 13—16.

A most handsome species, with a rather deep body gradually tapering posteriorly, and a rounded and sub-truncated head bearing minute spines upon its upper surface. The eye is proportionally small, and the mouth of medium size. Chestnut brown above; a diffused blackish streak along the middle of the flanks; golden beneath.

SYN.—*Moniana aurata*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 200.

Plate XXX, fig. 13, represents *Moniana aurata*, size of life; fig. 14 is a scale from the dorsal region; fig. 15, a scale from the lateral line; and, fig. 16, a scale from the abdominal region.

List of specimens.

Catal. No.	Corresponding No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
118	2703	20	Adult.	Piedra Painte, N.M.	1851	Col. J. D. Graham..	Alcoholic.	John H. Clark.....

2. MONIANA COMPLANATA, Grd.

PLATE XXXI, FIGS. 17—20.

The most compressed of all the species so far known. The profile is regular; the peduncle of the tail rather slender. The total length is two inches and a half, the head entering in it five times and a half. The mouth and eye are of but moderate size. Scales large and very deciduous. Pale red above, silvery on the sides, and yellowish beneath.

SYN.—*Moniana complanata*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 200.

Plate XXXI, fig. 17, represents *Moniana complanata*, size of life; fig. 18 is a dorsal scale; fig. 19, a scale from the lateral line; and, fig. 20, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
94	2694	3	Brownsville, Texas.....	1852	Capt. Van Vliet....	Alcoholic....	Capt. Van Vliet....

3. MONIANA FRIGIDA, Grd.

PLATE XXX, FIGS. 17—20.

This species is a little more than three inches in total length, and stands next to the largest of the hitherto known species. The head forms about the fifth of the length. The body is

rather deep and very much compressed; the caudal fin deeply furcated. The eye is circular, and its diameter contained four times in the length of the side of the head.

The rays of the fins are:

D 2, 8; A 2, 8; C 6, 1, 9, 8, 1, 6; V 8; P 13.

The color is of a reddish brown tint above; silvery white beneath. The middle of the flanks exhibits an indistinct or rather diffused silvery, sometimes blackish band.

SYN.—*Moniana frigida*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 200.

Plate XXX, fig. 17, represents *Moniana frigida*, size of life; fig. 18, a dorsal scale; fig. 19, a scale from the lateral line; fig. 20, a scale from the abdominal region.

List of specimens.

Catal. No.	Corres. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
100	2696	3	Adult.	Rio Salado, Texas	1851	Col. J. D. Graham	Alcoholic.	John H. Clark.
123	.....	100	..do..	.....do.....	1851	.....do.....	....do....	.....do.....
98	.....	10	..do..	Rio Sabinal, Texas	1851	.....do.....	....do....	.....do.....
124	2707	20	..do..	Rio Medina, Texas	1851	.....do.....	....do....	.....do.....

4. MONIANA COUCHI, Grd.

PLATE XXX, FIGS. 21—24.

Resembles *M. gracilis* most; is, however, distinguished from it by a less fusiform body and a much shorter head. This feature may be traced upon series of specimens of both species with an unfailing constancy. The eye is also smaller, and so is the mouth, as might be deduced from the traits just alluded to.

SYN.—*Moniana couchi*, GRD. in Proc. Acad. Nat. Sc. Philad., VIII, 1856, 201.

Plate XXX, fig. 21, represents *Moniana couchi*, size of life; fig. 22, a dorsal scale; fig. 23, a scale from the lateral line; fig. 24, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
103	2699	20	Adult.	China, New Leon, Mexico.	1853	Lt. D. N. Couch..	Alcoholic..	Lt. D. N. Couch...

5. MONIANA RUTILA, Grd.

PLATE XXX, FIGS. 1—4.

Has the general physiognomy of *M. gracilis*, from which it differs by a more advanced position of the dorsal fin, and by larger scales. Dorsal region greyish; sides and abdomen golden.

SYN.—*Moniana rutila*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 201.

Plate XXX, fig. 1, represents *Moniana rutila*, size of life; fig. 2, a dorsal scale; fig. 3, a scale from the lateral line; fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
95	2698	10	Adult.	Cadereita, New Leon, Mexico.	1853	Lieut. D. N. Couch...	Alcoholic.	Lieut. D. N. Couch.

6. MONIANA NITIDA, Grd.

This species differs from *M. couchi* by a more elongated and fusiform body, more elongated head, and much larger eye. From *M. rutila* it differs by the same characters of the body, but the head differs by the flattening of its upper surface. There are eleven longitudinal rows of scales upon the line of greatest depth of the body, five above and five below the lateral line. The latter, therefore, is nearly median, forming but a slight curve upon the middle of the abdomen. Color pale red; sides of head and middle of the flanks silvery.

Syn.—*Moniana nitida*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 201.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
96	2695	2	Cadereita, New Leon, Mex.	1853	Lt. D. N. Couch.....	Alcoholic.	Lieut. Couch.....

7. MONIANA FORMOSA, Grd.

Plate XXX, Figs. 5—8.

The prettiest species of the genus; the body is fusiform in profile and the tail very much tapering. The region above the lateral line is blackish brown in the adult, and reddish brown in the young, occasionally also dotted with black; the inferior regions are reddish yellow anteriorly and yellowish red posteriorly.

Syn.—*Moniana formosa*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 201.

Plate XXX, fig. 5, represents *Moniana formosa*, size of life; fig. 6 is a dorsal scale; fig. 7, a scale from the lateral line; fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
113 114	2700	4 20	Rio Mimbres, Mexico	1854	Major Emory.....	Alcoholic.	Dr. C. B. Kennerly ..

8. MONIANA GRACILIS, Grd.

A very graceful and slender species, resembling most *M. lutrensis*, from which it, however, differs by a much smaller head and a more arched back; the body itself being more compact. Ash grey above, yellowish white beneath; flanks silvery.

Syn.—*Moniana gracilis*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 201.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
116	7	Acapulco, near Monterey, New Leon..	1853	Lt. D. N. Couch.....	Alcoholic.	Lieut. Couch.....

9. MONIANA GIBBOSA, Grd.

Plate XXX, Figs. 9—12.

May readily be distinguished from all its congeners by a short and arched body, resembling a *Cyprinodon* as much as any fish we might compare it to. Pale reddish above; whitish beneath; sides silvery.

Syn.—*Moniana gibbosa*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 201.

Plate XXX, fig. 9, represents *Moniana gibbosa*, size of life; fig. 10 is a dorsal scale; fig. 11, a scale from the lateral line; and, fig. 12, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
105	3	Brownsville, Texas.....	1852	Captain Van Vliet.....	Alcoholic.	Captain Van Vliet.....

10. MONIANA PROSERPINA, Grd.

Is remarkable for its slender body, sub-conical head, and very small mouth. The eye is of moderate development. The total length is two inches and a quarter, the head constituting the fifth part of it. Eleven rows of scales may be counted upon the line of greatest depth of the body. Greyish brown above; metallic greyish white upon the sides and beneath.

Syn.—*Moniana proserpina*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 200.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
117	2702	10	Adult.	Devil's river, Texas..	1851	Col. J. D. Graham....	Alcoholic.	John H. Clark.....

LUXILUS LEPTOSOMUS, Grd.

Plate XIX, Figs. 9—12.

Spec. Char.—Outline regularly sub-fusiform; the depth forming a little more than the fifth of the entire length. The head enters five times and a half in the latter dimension. The anal fin is a great deal larger than the dorsal.

Syn.—*Luxilus leptosomus*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 203.

The scales are larger than in any other species of the same genus; they are about as deep as long, anteriorly uneven, posteriorly rounded, with radiating furrows upon their posterior section alone.

D 9; A 2, 13; C 5, 1, 9, 8, 1, 5; V 9; P 15.

Color greyish brown above; light reddish beneath; sides silvery. Edge of the furcated portion of the caudal, blackish grey.

Plate XIX, fig. 9, represents *Luxilus leptosomus*, size of life; fig. 10 is a scale from the dorsal region; fig. 11, a scale from the lateral line; and, fig. 12, a scale from the abdominal region. (The scales are represented in a reversed position.)

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
61	1	Adult.	Dry creek, near Victoria, Tex.	1854	Maj Emory	Alcoholic.	D. C B. Kennerly....

TIAROGA, Girard.

Gen. Char.—Head small, sub-conical, depressed. Mouth obliquely terminal, of moderate size, and without barbels of any kind. Upper jaw slightly longer than the lower. Eye of medium size. Isthmus very wide. Body slender, sub-fusiform, compressed. Fins are well developed; dorsal and anal narrow and high; caudal furcated. The insertion of the ventrals takes place in advance the anterior margin of the dorsal. The scales are small, deeper than long, with radiating furrows all around; the lateral line is median. The pharyngeals are similar to those in *Gobio*. The teeth are likewise of the same character: slender, sub-cylindrical upon their base, compressed upwards, of the raptatorial kind, of the hooked type, without grinding surface, and disposed upon a double row of one and three, thus: 1 | 3—3 | 1.

Syn.—*Tiaroga*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 204.

This genus bears some analogy to the Gudgeons (*Gobio*), differing from them by the absence of barbels, either maxillar or buccal, and by a less prominent snout.

TIAROGA COBITIS, Grd.

Plate XXVIII, Figs. 11—14.

Spec. Char.—Two inches and a half in total length, the head forming about the fifth part of it. Eyes approximating the upper surface of the head, which is rounded.

Syn.—*Tiaroga cobitis*, Grd. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 204.

The scales are deeper than long, elliptical, with wide radiating pericentrical furrows.

D 2, 8 + 1; A 1, 7 + 1; C 6, 1, 9, 8, 1, 5; V 8; P 15.

The upper regions are brownish, with small blackish spots; the inferior regions are unicolor of a yellowish tint. A black spot upon the base of the caudal fin.

Plate XXVIII, fig. 11, represents *Tiaroga cobitis*, size of life; fig. 12 is a scale from the dorsal region; fig. 13, a scale from the lateral line; fig. 14, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of spec.	Collected by—
155	2731	10	Rio San Pedro, trib. of Gila...	1851	Col. J. D. Graham ...	Alcoholic.	Jno. H. Clark...

1. GILA ELEGANS, B. & G.

Spec. Char.—Body very slender and caudal region very much attenuated. Head very much depressed, constituting about the fifth of the total length; eyes elliptical, their diameter entering seven times in the length of the side of the head. Posterior extremity of maxillar bone extending to a vertical line drawn in advance of the orbit. Isthmus very small. Fins very much developed. Scales sub-elliptical, narrower posteriorly than anteriorly; radiating furrows few and obsoletely developed. Color uniform reddish brown above, yellowish silver beneath; fins dull yellow.

Syn.—*Gila elegans*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 369; and, in *Stlgr.* Rep Exped. Zuñi and Color. Riv. 1853, 149; Fishes, pl. ii.—Gad. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 205.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
250	1	Colorado river, Cal.....	1854	Major Emory.....	Alcoholic.	Arthur Schott.....

2. GILA GRAHAMI, B. & G.

Plate XXIV, Figs. 7—12.

Spec. Char.—Body sub-fusiform, compressed; head entering about four times and a half in the total length. Posterior extremity of maxillar bone extending to a vertical line drawn across the anterior rim of the orbit. Anterior margin of dorsal fin somewhat nearer the insertion of the caudal than the extremity of the snout; anterior margin of anal situated posteriorly to the dorsal. Caudal strong and deeply furcated.

Syn.—*Gila grahamii*, B. &. G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 389.—Gad. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 205.

The disposition and structure of the scales will be better understood by comparing the figure of this species with those of the following one. The rays of the fins are:

D 2, 10; A 2, 10; C 10, 1, 9, 8, 1, 10; V 1, 10; P 17.

The upper surface of the head and the dorsal region are reddish brown; the upper half of the flanks greyish brown, and the lower half greyish yellow. The abdomen is dull yellowish. A metallic reflect prevailing all over the body. The fins being unicolor, of the tint of the region to which each of them belongs.

Plate XXIV, fig. 7, represents *Gila grahami*, somewhat reduced in size; fig. 8 is the head seen from beneath, showing the outline of the mouth; fig. 9, the head seen from above; fig. 10, a scale from the dorsal region; fig. 11, a scale from the lateral line; and, fig. 12, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
252	2801	6	Adult.	Rio San Pedro, trib. of Rio Gila	1851	Col. J. D. Graham....	Alcoholic.	Jno. H. Clark....
253	2802	1	..do..	.....do.....	1851	.....do.....	....do....	.....do.....

3. GILA EMORII, B. & G.

PLATE XXXIII, FIGS. 5—10.

SPEC. CHAR.—Body elongated, compressed. Profile of head continuous with that of the body, and gradually tapering from the nape to the snout. Head forming the fifth of the entire length. Mouth nearly terminal, though inferior still: the upper jaw overlapping the lower one of the thickness of the lip; the posterior extremity of the maxillar bone not extending as far as the anterior rim of the orbit. Eyes circular, of medium size. Anterior margin of dorsal fin nearer the extremity of the snout than the insertion of the caudal; anterior margin of anal fin nearly opposite the posterior margin of the dorsal. Caudal fin deeply furcated and slender. The extremity of the ventrals not extending to the anterior edge of the anal. The pectorals are lanceolated, their extremity not reaching the insertion of the ventrals.

SYN.—*Gila emorii*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 388.—GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 205.

The scales are small, elongated, sub-elliptical or sub-quadrangular, longer than deep, affecting a curious arrangement (see fig. 5). The lateral line undergoes a slight deflection along the middle of the flanks.

Color uniform silvery, with a rather greyish tint along the upper regions.

Plate XXXIII, fig. 5, represents *Gila emorii*, size of life; fig. 6 is the head from beneath, showing the outline of the mouth; fig. 7, the head seen from above; fig. 8, a dorsal scale; fig. 9, a scale from the lateral line; and, fig. 10, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
247	1	Near the mouth of Gila river....	1849	Major Emory.....	Alcoholic.	Dr. Jno. L. Leconte....

1. TIGOMA PULCHELLA, Grd.

PLATE XXXIV, FIGS. 5—8.

SPEC. CHAR.—The head is contained four times and a half in the total length. The mouth is small; the posterior extremity of the maxillar bone not extending as far as the anterior rim of the orbit. Diameter of the eye entering five times and a half in the length of the side of the head. The greatest depth of the body is contained about five times in the total length, of which the caudal fin forms the sixth part. Two rudimentary rays at the anterior margin of the dorsal fin instead of one.

SYN.—*Gila pulchella*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 29
Tigoma pulchella, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 206.

The scales are sub-elliptical, sometimes irregularly so, with radiating furrows upon their posterior section alone; the lateral line being very much deflexed upon the middle of the flanks.

D 2, 9; A 1, 9; C 4, 1, 9, 8, 1, 3; V 9; P 17.

The color is greyish brown above and laterally; dingy yellow beneath.

Plate XXXIV, fig. 5, represents *Tigoma pulchella*, size of life; fig. 6 is a scale from the dorsal region; fig. 7, a scale from the lateral line; fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
233	2787	2	Rio Mimbres, tributary of Lake Guzman, Mexico.	1851	Col J. D. Graham.	Alcoholic..	John H. Clark ...

2. TIGOMA PURPUREA, Grd.

This is a much stouter fish than *T. pulchella*, which it resembles in other respects; but its head is larger and its body shorter. The anterior margin of the dorsal is nearer the extremity of the caudal than the tip of the snout, whilst in *T. pulchella* it is nearer to the snout than the extremity of the caudal. The scales are also larger than in *T. pulchella*. The color is of purplish black on the dorsal region and laterally; beneath yellowish.

Syn.—*Tigoma purpurea*, Gird. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 206.

List of specimens.

Catal. No.	Cor. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
224	2778	15	San Bernardino, Rio Huagui, west of the Sierra Madre.	1854	Major Emory.....	Alcoholic.	Dr. C. B. Kennerly....

3. TIGOMA INTERMEDIA, Grd.

Intermediate between *T. pulchella* and *T. purpurea*, more closely related, however, to the former than to the latter. The fins are much less developed, the inferior fins especially are quite small.

Syn.—*Tigoma intermedia*, Gird. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 206.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
232	2786	20	Rio San Pedro, tributary of the Gila..	1851	Col. J. D. Graham..	Alcoholic.	Jno. H. Clark..

4. TIGOMA GIBBOSA, Grd.

PLATE XXXIII, FIGS. 1—4.

SPEC. CHAR.—Body rather thick; dorsal region between dorsal fin and occiput more arched than generally observed in this genus. Head forming a little less than the fourth of the entire length; greatest depth nearly equal to the length of head. Eyes quite large; their diameter contained five times in the length of the side of head. Anterior margin and dorsal fin nearer the base of caudal than the tip of snout. Ventrals, as usual, in advance of the dorsal, and anal behind the latter. Greatest length of caudal fin constituting nearly the seventh of the entire length.

SYN.—*Gila gibbosa*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 28.
Tigoma gibbosa, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 207.

The scales, irregularly sub-elliptical, are longer than deep, and exhibit radiating furrows upon their entire periphery.

D 1, 8 + 1; A 1, 9; C 5, 1, 9, 8, 1, 4; V 9; P 17.

Color in alcohol, dark reddish brown above and laterally; dull yellow beneath.

Plate XXXIII, fig. 1, represents *Tigoma gibbosa*, size of life; fig. 2 being a scale from the dorsal region; fig. 3, a scale from the lateral line; and, fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
223	2776	15	Rio Santa Cruz, Mex	1851	Col. J. D. Graham..	Alcoholic.	Jno. H. Clark.....
222	2775	10	Tucson, Sonora	.....	Lt. J. G. Parke	....do....	Dr. A. L. Heermann.

5. TIGOMA NIGRESCENS, Grd.

PLATE XXXII, FIGS. 1—4.

This is quite an elegant species, being elongated and slender, like *T. pulchella* and *T. gracilis*. It differs from *T. gibbosa* by a more conical head and snout. The ground color is yellowish, the middle of the scales being covered with crowded black dots, the back and sides appearing almost black. The belly is unicolor. In the young the upper regions are lighter than in the adult.

SYN.—*Tigoma nigrescens*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 207.

Plate XXXII, fig. 1, represents *Tigoma nigrescens*, size of life; fig. 2, a dorsal scale; fig. 3, a scale from the lateral line; fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
220	2774	10	Boca Grande	1854	Maj. Emory.....	Alcoholic.	Dr. C. B. Kennerly...
219	.....	1	Janos river	1854	.....do.....	....do....	.....do.....

6. TIGOMA PULCHRA, Grd.

PLATE XXXII, FIGS. 5—8.

The body is gracefully elongated, in which respect it resembles *T. nigrescens*, from which it may be distinguished by its smaller head and larger scales. The color, moreover, is of a far more brilliant type: the dorsal region is reddish or blackish brown, the sides and belly, of a uniform golden yellow; a diffused black streak may occasionally be seen along the upper portion of the flanks, very likely more predominant in the male than in the female.

SYN.—*Tigoma pulchra*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 207.

Plate XXXII, fig. 5, represents *Tigoma pulchra*, size of life; fig. 6, a dorsal scale; fig. 7, a scale from the lateral line; fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimens.	Collected by—
227	2781	3	Chihuahua river and tributaries...	1855	John Potts, Esq...	Alcoholic..	John Potts, Esq...
228	2782	4	.....do.....do.....	1855	.....do.....	....do....	.....do.....

PTYCHOCHEILUS LUCIUS, Grd.

PLATE XXXIV, FIGS. 1—4.

A very characteristic species. The body is compressed, but the head is flattened or depressed and very much developed, constituting nearly the fourth of the entire length. The dorsal and ventrals are situated quite posteriorly. The scales are below the medium size, and the lateral line is deflexed upon the abdomen. The pharyngeal bones are very slender; the inferior limb is almost exiguous and proportionally as long as in *P. grandis*. There are, however, but four teeth upon the main row, instead of five, as in the case of *P. grandis*. Color bluish grey above; silvery golden beneath.

SYN.—*Ptychocheilus lucius*, GRD. in Proc. Acad. Nat. Sc. Philad. VIII, 1856, 209.

Plate XXXIV, fig. 1, represents *Ptychocheilus lucius*, size of life; fig. 2 is a scale from the dorsal region; fig. 3, a scale from the lateral line; fig. 4, a scale from the abdominal region.

List of specimens.

Catal. No.	Cor. No. of teeth.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
203	2757	1	Rio Colorado, Cal.....	1854	Major Emory.....	Alcoholic	Arthur Schott.....

Family CYPRINODONTIDAE.

CYPRINODON, Lacép.

The genus *Cyprinodon* is composed of small fishes, more or less sub-elliptical in their general appearance, with no other differences between the sexes, except that in the female the body is occasionally more elongated than in the male, and approaching to a sub-fusiform shape. The position and shape of the fins are nearly alike, the dorsal alone being somewhat higher in the male than in the female, without, however, approaching to anything like that of *Poecilia*. The caudal is sub-truncated upon its posterior margin. The ventrals are small. The head is rather well developed and anteriorly rounded off. The teeth are elongated, broadest at the crown, which is trilobed. The gill apertures are continuous under the throat.

These fishes inhabit the brackish waters, and are especially numerous in the warm region of the temperate zone.

1. CYPRINODON ELEGANS, B. & G.

PLATE XXXVII, FIGS. 1—7.

SPEC. CHAR.—The general form differs according to the sexes; it being sub-fusiform in the female and sub-elliptical in the male. The head constitutes about the fourth of the total length. The diameter of the eye enters about four times in the sides of the head. The dorsal fin is longer than high; its anterior margin being equidistant between the extremity of the snout and the base of the caudal; its upper margin rounded off. The caudal, which forms about the seventh of the total length, is posteriorly sub-truncated. The origin of the ventrals is situated opposite the anterior margin of the dorsal fin.

SYN.—*Cyprinodon elegans*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 389.

The dorsal region is deep bluish black, the sides of the body being variegated with bluish black and olive. The posterior edge of the caudal fin is black in the male. A black spot, more conspicuous in the female than in the male, may be observed at the posterior margin of the dorsal fin.

D 11; A 10; C 3, 1, 8, 8, 1, 2; V 6; P 14.

Plate XXXVII, fig. 1, represents the female sex of *Cyprinodon elegans*, size of life. Fig. 2 is an outline from above. Fig. 3, a section across the region of greatest depth. Fig. 4, the male sex of the same species, also size of life. Fig. 5, its teeth. Fig. 6, an outline from above. Fig. 7, a transverse section.

List of specimens.

Catal. No.	No. of spec.	Sex.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
686	21	♂	Camanche Springs, Rio Grande del Norte (Rio Bravo).	1851	Col. J. D. Graham	Alcoholic.	John H. Clark
687	11	♀	do	1851	do	do	do

2. CYPRINODON GIBBOSUS, B. & G.

PLATE XXXVIII, FIGS. 1—7.

SPEC. CHAR.—General form sub-elliptical, the dorsal region arched in both sexes. The nape often depressed or sub-concave. The head is rather small, entering four times and a half in the total length. The eye is large; its diameter is a little more than the third of the side of the head. The dorsal fin of the male is higher than long, that of the female somewhat longer than high. The caudal is sub-truncated posteriorly, and enters about six times and a half in the total length. The anal fin is less deep and more rounded exteriorly than in *C. elegans*. The origin of the ventrals is likewise placed somewhat more posteriorly with reference to the anterior margin of the dorsal. The pectorals are more elongated also than in the latter species.

SYN.—*Cyprinodon gibbosus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 390.

The dorsal region, the head, and dorsal fin are of a uniform bluish black in the male; the ventral region is golden yellow. The caudal fin is posteriorly margined with black; the anal, ventrals, and pectorals being yellow. The female exhibits vertical bars of black on the side of the body. The fins are unicolor, except the dorsal, which is provided posteriorly with a black patch.

D 10; A 11; C 4, 1, 8, 7, 1, 3; V 5; P 15.

Plate XXXVIII, fig. 1, represents the male sex of *Cyprinodon gibbosus*, size of life. Fig. 2 exhibits its teeth. Fig. 3, an outline from above. Fig. 4, a section of the body. Fig. 5 is the female sex, also size of life. Fig. 6, an outline from above. Fig. 7, a section of the body.

List of specimens.

Catal. No.	No. of spec.	Sex.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
684	15	♂	Indianola, Texas.....	1851	Col. J. D Graham.....	Alcoholic.	John H. Clark.....
685	10	♀	.....do.....	1851	.....do.....	....do....	.....do.....

3. CYPRINODON BOVINUS, B. & G.

PLATE XXXVII, FIGS. 12—18.

SPEC. CHAR.—General form sub-elliptical; dorsal region arched in both sexes. Head rather large, constituting the third of the length, the caudal fin excluded. The eye is moderate sized; its diameter entering four times in the length of the side of the head. The anterior margin of the dorsal fin is equidistant between the extremity of the snout and the insertion of the caudal fin; it is higher than long in the male, and longer than high in the female. The caudal, which enters seven times in the total length, is sub-truncated posteriorly. The anal is shorter than in *C. elegans*, and inserted somewhat more backwards. The origin of the ventrals is placed opposite the anterior margin of the dorsal fin.

SYN.—*Cyprinodon bovinus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 389.

The male is uniform blackish brown above, olivaceous beneath; the fins being unicolor, except the caudal, which has its posterior margin black. The female has the lower portion of the flank irregularly maculated; the fins being unicolor also, except the dorsal, which exhibits a black spot at its posterior margin.

D 9; A 8; C 6, 1, 7, 6, 1, 5; V 6; P 14.

Plate XXXVII, fig. 12, represents the male sex of *Cyprinodon bovinus*, size of life. Fig. 13, its teeth. Fig. 14, an outline from above. Fig. 15, a section of the body. Fig. 16, the female sex of the same species. Fig. 17, a section of the body. Fig. 18, an outline from above.

List of specimens.

Catal. No.	No. of spec.	Sex.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
682	10	♂	Leon's Spring, Texas...	1851	Col. J. D. Graham.....	Alcoholic.	John H. Clark .....
683	6	♀	.....do.....	1851	.....do.....	....do....	..... do .....

4. CYPRINODON MACULARIUS, B. & G.

PLATE XXXVII, FIGS. 8—11.

SPEC. CHAR.—The head constitutes one-fourth of the entire length. The eye is moderate; its diameter entering four times in the length of the side of the head. The dorsal fin in the female is as long as high, its anterior margin being somewhat nearer the insertion of the caudal than the extremity of the snout; its base enters six times in the total length. The caudal is posteriorly sub-convex, and is contained nearly six times and a half in the total length. The anal is narrower, though deeper, than the dorsal. The ventrals being very small, and inserted somewhat anteriorly to the dorsal fin.

SYN.—*Cyprinodon macularius*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 389.

The color above is reddish brown, yellowish beneath, maculated with black; the spots on the sides having a tendency to arrange themselves into vertical bands. Dorsal blackish; the other fins dull yellow, greyish at their base.

D 8; A 10; C 3, 1, 7, 6, 1, 2; V 7; P 12.

Plate XXXVII, fig. 8, represents the female sex of *Cyprinodon macularius*, size of life. Fig. 9, its teeth. Fig. 10, an outline from above. Fig. 11, a section of the body.

List of specimens.

Catal. No.	No. of spec.	Sex.	Locality.	When collected	Whence obtained.	Nature of specimen.	Collected by—
992	8	♀	Rio San Pedro (Rio Gila).....	1851	Col. J. D. Graham.....	Alcoholic	Jno. H. Clark...

HYDRARGYRA SIMILIS, B. & G.

PLATE XXXV, FIGS. 1—8.

SPEC. CHAR.—Body elongated and sub-fusiform. Head sub-conical in profile, constituting somewhat more than the fourth of the total length. Diameter of the eye entering five times in the side of the head. Dorsal fin higher than long, its base being contained about nine times in the total length. The caudal fin, posteriorly sub-truncated, constitutes about the seventh of the total length. Anal narrow and deep, its central rays, in the male, more elongated than in the female. Ventrals rather small. Pectorals of moderate development. Scales about as deep as long, anteriorly sub-concave, posteriorly convex, with a few radiating furrows upon their anterior section alone.

SYN.—*Hydrargyra similis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 389.

The back is bluish grey, the sides and abdomen yellowish. Transverse black bars in both sexes. Fins unicolor in the female; the dorsal fin of the male exhibiting a black spot at its posterior margin.

D 11; A 8; C 3, 1, 8, 7, 1, 2; V 5; P 18.

Plate XXXV, fig. 1, represents *Hydrargyra similis*, size of life. Fig. 2, an outline from above. Fig. 3, a dorsal scale. Fig. 4, an abdominal scale. Fig. 5, is the male sex of the same species, also size of life. Fig. 6, an outline from above. Fig. 7, a dorsal scale. Fig. 8, a scale from the abdominal region.

List of specimens.

Catal. No.	No of spec.	Age & Sex.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
651	12	Adult ♂ & ♀	Indianola, Texas.....	1851	Col. J. D. Graham....	Alcoholic.	Jno. H. Clark...

FUNDULUS GRANDIS, B. & G.

Plate XXXVI.

Spec. Char.—The body is rather plump, its greatest thickness being somewhat more in the male and somewhat less in the female than the fourth of the total length, in which the head enters about four times. Scales on the occiput and opercular apparatus very large. Diameter of the eye entering about five times in the side of the head. Caudal posteriorly rounded. Anal inserted under the posterior portion of the base of the dorsal, the tips of the rays of both these fins being nearly even: they are more elongated in the male than in the female.

Syn.—*Fundulus grandis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 389.

The dorsal region is bluish black; the sides greyish, with yellow spots. Beneath dull yellow. Dorsal and caudal fins in the male deep metallic black, yellow spotted, external margin yellow; other fins yellowish; base of anal also spotted. Body and fins in the female unicolor.

D 11; A 12; C 2, 1, 9, 9, 1, 2; V 7; P 18.

Plate XXXVI, fig. 1, represents the female sex of *Fundulus grandis*, size of life. Fig. 2, an outline from above. Fig. 3, a dorsal scale. Fig. 4, an abdominal scale. Fig. 5 is the male sex of the same species, also size of life. Fig. 6, an outline from above. Fig. 7, a dorsal scale. Fig. 8, an abdominal scale.

List of specimens.

Catal. No.	No. of spec.	Sex and age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
650	5	Adult ♂ & ♀	Indianola, Texas.....	1851	Col. J. D. Graham....	Alcoholic.	Jno. H Clark...

POECILIA, Schn.

It having been ascertained that *Mollinesia* is the female sex of *Poecilia*, the species hitherto described under these two heads must necessarily come under that of *Poecilia* alone, which has priority. Much is yet left undone as to the natural history of these fishes.

The genus *Poecilia* is closely related to *Limia* of Poey, from which it differs by a more backward position of the anal and ventral fins as compared to the dorsal. The latter, in the male sex, acquiring likewise a development which it never reaches in *Limia*. The anal fin, moreover, has the same structure in both sexes, and which is not the case in *Limia*.

POECILIA LINEOLATA, Grd.

Plate XXXV, Figs. 9—11.

Spec. Char.—Head rather small and acute, entering four times and a half in the total length. The diameter of the eye is contained about four times in the side of the head: once in advance of the anterior rim of the orbit. Dorsal fin in the female longer than high, its anterior margin nearer the extremity of the snout than the insertion of the caudal, and its base equal to the length of the head. The caudal, which is posteriorly rounded off, enters four times and a half in the total length. The anal is small, inserted opposite the posterior third of the base of the dorsal. The insertion of the small ventrals takes place in advance of the anterior margin of the dorsal fin. The scales are much deeper than long.

The color is olivaceous or reddish brown, with seven longitudinal series of black spots occupying the centre of the scales. Dorsal and anal fins with transverse black filets; other fins unicolor.

D 14; A 7; C 5, 1, 8, 8, 1, 4; V 6; P 12.

Plate XXXV, fig. 9, represents the female sex of *Poecilia lineolata*, size of life. Fig. 10, a dorsal scale. Fig. 11, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Sex and Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
667	3	♀ Adult.	Brownsville, Texas.....	1853	Capt. Van Vliet.....	Alcoholic.	Capt. Van Vliet.....
668	4	♀	Fort Brown, Texas.....	1853	Major Emory.....	...do	Jno. H. Clark.....

LIMIA, Poey.

The external row of acerated and incurved teeth, and the narrow band of velvet-like ones which may be observed upon the jaws, are characters common to *Poecilia* as well as to *Limia*. The caudal fin is likewise rounded off posteriorly in both the genera just alluded to. But whilst the male sex of *Poecilia* differs from its female by an extraordinary development of the dorsal fin, the male sex of *Limia* is distinguishable from its female by a narrower and much more elongated anal fin. The ventral fins, in *Limia*, are inserted in advance of the anterior margin of the dorsal, whilst the anal remains in a more backward position, with its posterior margin projecting beyond that of the dorsal fin.

1. LIMIA POECILOIDES, Grd.

Plate XXXVIII, Figs. 8—14.

Spec. Char.—Body very much compressed, rather deep upon its middle; the head constituting about the fourth of the total length, the proportions varying somewhat, according to the sexes. The teeth of the external row are very slender and exiguous. The dorsal fin is larger in the male than in the female; its anterior margin is nearer the extremity of the snout than the posterior edge of the caudal, which is convex. The anal fin, in the female, is larger than the dorsal, and inserted posteriorly to the latter; whilst in the male the same is situated opposite the middle region of the dorsal. The ventrals are very small in both sexes, and inserted in advance of the anterior margin of the dorsal. The pectorals are rather short and broad.

The color is reddish brown, apparently uniform in the female, whilst the male exhibits transverse fascia of a darker hue, and a small blackish spot at the base of each scale,

constituting about seven longitudinal series on either side of the body. The dorsal fin is likewise transversely black spotted.

D 13; A 6; C 2, 1, 7, 7, 1, 2; V 5; P 13. (Male.)
8; 12; do ; do ; do . (Female.)

Plate XXXVIII, fig. 8, represents the male sex of *Limia poeciloides*, size of life. Fig. 9, an enlarged front view of the mouth, showing the teeth. Fig. 10, an outline from above. Fig. 11, ideal transverse section across the greatest depth and width. Fig. 12, female sex of the same species, size of life. Fig. 13, an outline from above. Fig. 14, a transverse section.

List of specimens.

Catal. No.	No. of spec.	Sex.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
670	2	♂ ♀	Indianola, Texas.....	1851	Col. J. D. Graham...	Alcoholic.	John H. Clark.....

2. LIMIA VENUSTA, Grd.

Plate XXXIX, Figs. 20—23.

Spec. Char.—The body is gracefully fusiform, elongated, and compressed; the head forming somewhat less than the fourth of the total length. The teeth of the external row are slender and acute, a good deal larger than in the preceding species, and the snout is thicker and less depressed. The dorsal fin is larger than the anal, and situated more in advance than in the species just alluded to, the same sexes being compared. The shape and position of the other fins do not differ materially in both species, except the pectorals, which are more slender in the present one. The posterior margin of the caudal fin is, as usual, rounded off.

The color is reddish brown, apparently uniform, although traces of black spots or dots seem to have existed at the base of the scales; but the epidermis being partly removed from the specimens preserved in alcohol, the living ones may exhibit distinct spots.

D 13; A 11; C 3, 1, 8, 8, 1, 2; V 5; P 10. (Female.)

Plate XXXIX, fig. 20, represents the female sex of *Limia venusta*, size of life. Fig. 21 is a front view of the mouth, considerably enlarged in order to show the teeth. Fig. 22, an outline from above. Fig. 23, an ideal section across the line of greatest depth and width.

List of specimens.

Catal. No.	No. of spec.	Sex.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
669	1	♀	Indianola, Texas.....	1851	Col. J. D. Graham....	Alcoholic.	John H. Clark.....

1. GAMBUSIA NOBILIS, Grd.

Plate XXXIX, Figs. 8—11.

Spec. Char.—Body rather short and stoutish; head large, forming about the fourth of the total length. Anterior margin of dorsal fin situated midway between the extremity of the snout and the posterior margin of the caudal. Anal much smaller than the dorsal; both being comparatively broad and exteriorly rounded. Ventral fins very small; pectorals moderate sized and rather short.

Syn.—*Heterandria nobilis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 390.

The ground color is dark reddish brown above; lighter beneath: the edge of the scales being margined with black.

D 8; A 7; C 4, 1, 7, 7, 1, 3; V 6; P 10. (Female.)

Plate XXXIX, fig. 8, represents the female sex of *Gambusia nobilis*, size of life. Fig. 9, a front view of its mouth to show the dentition. Fig. 10, outline from above. Fig. 11, an ideal section across the line of greatest depth and width.

List of specimens.

Catal. No.	No. of spec	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
679	6	Leon's Spring, Texas	1851	Col. J. D. Graham	Alcoholic	John H. Clark
680	1	Camanche Spring, Texas	1851	do	do	do
681	2	Zoquite, Texas	1851	do	do	do

2. GAMBUSIA AFFINIS, Grd.

Plate XXXIX, Figs. 12—15.

Spec. Char.—Body elongated, sub-fusiform, and slender. Head rather small, constituting the fifth of the entire length. The dorsal fin is narrow, its anterior margin somewhat nearer the extremity of the snout than the margin of the caudal fin. Anal like the dorsal in size and shape. Ventrals slender and elongated; pectorals moderate sized and elongated.

Syn.—*Heterandria affinis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 390.

Color yellowish brown above; orange beneath. Fins unicolor, except the dorsal, which exhibits narrow dark cross bands. The caudal is occasionally maculated with black.

D 6; A 8; C 3, 1, 7, 6, 1, 2; V 5; P 12. (Female.)

Plate XXXIX, fig. 12, represents the female sex of *Gambusia affinis*, size of life. Fig. 13, a front view of its mouth, exhibiting the dentition. Fig. 14, an outline from above. Fig. 15, an ideal section across the line of greatest depth and width.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
677	3	Rio Medina, Texas	1851	Col. J. D. Graham	Alcoholic	John H. Clark
678	1	Rio Salado, Texas	1851	do	do	do

3. GAMBUSIA PATRUELIS, Grd.

Plate XXXIX, Figs. 1—7.

Spec. Char.—Body elongated, sub-fusiform, compressed. Head constituting the fifth of the entire length, although larger than in *G. affinis*. The dorsal fin is somewhat smaller than the anal, and its anterior margin nearer the posterior edge of the caudal than the extremity of the snout. The origin of the anal is placed further in advance of the dorsal than in any of the species of the genus figured on the accompanying plate. The ventrals are rather small, whilst the pectorals are broad and considerably more developed than in the other species.

Syn.—*Heterandria patruelis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 390.

The color is dark reddish brown above; yellowish beneath, with an oblique dark streak across the cheek beneath the orbit. The caudal fin is occasionally barred.

D 7; A 10; C 3, 1, 7, 6, 1, 2; V 6; P 11. (Female.)

Do.; 7; do. ; do.; do. (Male.)

Plate XXXIX, fig. 1, represents the female sex of *Gambusia patruelis*, size of life. Fig. 2, an outline from above. Fig. 3, an ideal section of the body. Fig. 4, the male sex of the same species, size of life. Fig. 5, an enlarged view of its mouth, showing its dentition. Fig. 6, an outline from above. Fig. 7, a cross section of its body.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
672	12	Rio Sabinal, Texas	1851	Col. J. D. Graham	Alcoholic.	John H. Clark
673	4	Rio Leona, Texas	1851	do.	do.	do.
674	6	Rio Nueces, Texas	1851	do.	do.	do.
675	3	Elm creek, Texas	1851	do.	do.	do.
676	1	Turkey creek, Texas	1851	do.	do.	do.

GIRARDINUS OCCIDENTALIS, Grd.

PLATE XXXIX, FIGS. 16—19.

SPEC. CHAR.—Body slender and elongated, dorsal region sub-convex. Head rather small and conical, constituting somewhat more than the fifth of the entire length. The dorsal fin is small and narrow; its anterior margin being a little nearer the extremity of the snout than the posterior edge of the caudal fin. The anal resembles the dorsal in size and shape. The ventral fins are very small and short, and the pectorals rather broad and moderate sized.

SYN.—*Heterandria occidentalis*, B. & G. in Proc. Acad. Nat. Sc. Philad. VI, 1853, 390.

The color above is reddish brown; beneath reddish yellow. A black streak may be observed along the ventral line and under the peduncle of the tail. The fins being unicolor, of a light yellowish tint.

D 6; A 7; C 4, 1, 7, 6, 1, 3; V 6; P 10. (Female.)

Plate XXXIX, fig. 16, represents the female sex of *Girardinus occidentalis*, size of life. Fig. 17, a front view of its mouth, magnified, showing the teeth. Fig. 18, an outline from above. Fig. 19, a cross section of the body.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
671	5	Rio Santa Cruz, Mexico	1851	Col. J. D. Graham	Alcoholic.	John H. Clark

Family CHARACINIDAE.

The body is scaly, and the majority of the fishes of this family have, in addition to the dorsal fin, an adipose finlet. The upper arcade of the mouth is formed anteriorly by the permaxillars,

and sideways by the maxillar bones. The dentition varies greatly according to the genera; the teeth may even be wanting. The pharyngeal bones do not exhibit those large teeth which we have observed amongst Cyprinoids. The air-bladder is divided into an anterior and a posterior partition, as is the case in the Cyprinoids, and there is, in addition, a connecting chain of small bones between the same air-bladder and the organ of audition such as may be observed in both Cyprinoid and Siluroid families. The pseudobranchia are not visibly developed, an organic trait by which these fishes may easily be distinguished from the *Salmonidae*. In such as are provided with an adipose finlet, an oviduct leads the eggs out, not allowing them to fall into the abdominal cavity. The intestine is provided with numerous *cæca*.

ASTYANAX, B. & G.

Gen. Char.—Body compressed; abdomen not serrated. Scales large. Adipose fin present. A double row of teeth on the premaxillaries and anterior portion of the maxillaries. Neither canine nor palatine teeth. Gill apertures continuous under the throat; branchiostegal rays three on either side. Pharyngeal teeth absent, else so minute as not to be perceptible. Dorsal fin situated above the ventrals.

Syn.—*Astyanax*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 26.

The premaxillar teeth have the same structure as those on the lower jaw: Plate VIII, fig. 6, giving a very good idea of what that structure is. The teeth observed at the upper portion of the anterior edge of the maxillar bones are very small, simple, conical, imperceptible to the naked eye.

The species described below, the only one so far known of its genus, is the northernmost representative of the family *Characinidae*, which is thus added to the fauna of the United States of North America.

ASTYANAX ARGENTATUS, B. & G.

Plate VIII, Figs. 5—9.

Spec. Char.—Body rather short, deep, and very much compressed, the head forming about the fifth of the total length. The snout is abbreviated and rounded off; the mouth of medium size, its angles not extending so far back as a vertical line drawn in advance of the pupil. The eye is large and circular; its diameter entering about three times and a half in the length of the side of the head. Opercular apparatus quite narrow. Dorsal fin higher than long, somewhat concave upon its upper margin; its anterior edge being placed midway between the extremity of the snout and the insertion of the caudal fin. Adipose fin quite slender, situated opposite the posterior portion of the anal. Caudal fin deeply furcated and longer than the head. Anal fin longer than deep, exteriorly concave, much deeper anteriorly than posteriorly, and inserted backwards of the dorsal. The ventrals, rather slender, are inserted nearly under the middle of the dorsal. The pectorals, larger than the ventrals, are also slender; their tips, however, do not reach the insertion of the ventrals when stretched in that direction.

Syn.—*Astyanax argentatus*, B. & G. in Proc. Acad. Nat. Sc. Philad. VII, 1854, 27.

The scales are deeper than long, somewhat truncated anteriorly. There are no radiating furrows, but some very well marked stria may be observed upon their posterior section. The lateral line is very conspicuous, and slightly bent downwards upon the middle of the abdomen.

Br. III: 111; D 1, 10; A 1, 21; C 5, 1, 9, 8, 1, 4; V 8; P 13.

The dorsal region is of a deep reddish brown, whilst the sides of the abdomen are of a bright silvery hue; the fins being reddish yellow. An elongated black spot exists at the base of the caudal fin, extending along the central rays to near the posterior edge of that fin.

Plate VIII, fig. 5, represents *Astyanax argentatus*, size of life. Fig. 6 is an enlarged view of the open mouth, in order to show the peculiar shape of the teeth, some of which being

represented isolated in *a*, *b*, *c*, and *d*. Fig. 7 is a scale from the dorsal region. Fig. 8, a scale from the lateral line; and, fig. 9, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
869	24	Adt. & y'g.	Rio Nueces, Texas	1851	Col. J. D. Graham	Alcoholic.
870	8	.....	Rio Leona, Texas	1851	....do	....do
871	3	.....	Zoquito, Texas	1851	....do	....do
872	10	.....	Camanche Springs, Texas	1851	....do	....do
873	8	.....	Elm creek, Texas	1851	....do	....do
874	4	.....	Turkey creek, Texas	1851	....do	....do
875	.....	.....	San Felipe, Texas	1851	....do	....do
876	2	.....	Devil's river, Texas	1851	....do	....do
877	36	.....	Brownsville, Texas	1852	Captain Van Vliet	....do
878	1	.....	Mouth of Rio Grande (Rio Bravo)	1853	Major Emory	....do
879	4	.....	Rio Sabinal, Texas	1854	....do	....do

Family SCOPELIDAE.

One specimen of SAURUS MEXICANUS was collected by Gustavus Würdemann, along the coast of Texas. It is the only species, so far known, representing this family in the Gulf of Mexico.

Family CLUPEIDAE.

Five species of this family have been gathered at various places along the Gulf of Mexico. Amongst them are two *Engraulis* (anchovies), one *Meletta*, one *Chatoessus*, and one *Clupeonia*. They are chiefly due to the exertions of Captain Van Vliet, John H. Clark, under Major Emory, and Gustavus Würdemann.

Family MURAENIDAE.

These are eel-like fishes, characterized by the absence of ventral fins, and sometimes also by the want of the pectorals themselves. The air-bladder has a communication with the throat through an air-duct, as is the case in the sub-order of *Malacoterygii abdominales*. Pseudobranchia do not exist in this family. The pyloric appendages are wanting. As far as anatomic observations have been traced upon representatives of this family, there seems to be no oviduct: the eggs falling in the abdominal cavity, whence expelled through a postanal aperture.

ANGUILLA TYRANNUS, Grd.

PLATE XL.

SPEC. CHAR.—Head quite depressed; anterior third of body sub-cylindrical, somewhat deeper than wide, compressed upon the rest of its length. The cephalic region measured from the extremity of the lower jaw to the insertion of the pectoral fins, enters about seven times and a half in the total length. The lower jaw is longer than the upper; the gape of the mouth is nearly horizontal; is angle, corresponding to a vertical line drawn inwardly of the posterior rim of the orbit. The eye is well developed and sub-circular; its diameter entering twice upon the distance between its anterior rim and the tip of the lower jaw.

The posterior nostril is large and placed near the eye; the anterior nostril, on the other hand, is very small, situated near the apex of the snout, and exteriorly of which may be seen a short membranous expansion just in advance of the upper lip. The teeth are small, conical, disposed upon a narrow longitudinal band on both jaws and along the vomer also; wider anteriorly than posteriorly where it tapers away. The branchial apertures are small, vertical, situated in advance of the insertion of the pectoral fins. The origin of the dorsal fin corresponds to the anterior third of the total length; the origin of the anal fin is placed somewhat anteriorly to the middle of the entire length. The scales are narrow, elongated, and cellular in structure; and, although imbedded in the skin, they are quite apparent to the naked eye. They are disposed upon small group with their longitudinal diameter in every possible directions, giving the surface of the animal a checkered aspect. They extend over the base of the fins. The upper region is dark olive green; the inferior region being dull yellow or light olive. The periphery of the caudal fin is black.

Plate XL, fig. 1, represents *Anguilla tyrannus*, reduced from a specimen over two feet long. Fig. 2 is a scale from the dorsal region; fig. 3, a scale from the abdominal region.

List of specimens.

Catal. No.	No. of spec.	Sex and age.	Locality.	When collected.	Whence obtained.	Nature of specimen.
857	1	Adult.	Mouth of Rio Grande del Norte (R. Bravo)..	1853	Major Emory	Alcoholic..
858	4	.....	Matamoras, Mexico.....	1852	Lieutenant D. N. Couch.....	....do.....
859	5	Young..	.....do.....	.....	.....do.....	....do.....

NEOMURAENA, Girard,

Gen. Char.—Neither pectoral nor ventral fins; dorsal and anal fins low, uniting into a point posteriorly. Anterior maxillar teeth largest. One series of vomerine teeth. Gill apertures lateral and sub-circular.

NEOMURAENA NIGROMARGINATA, Grd.

Plate XLI.

Spec. Char.—Head rather slender and sub-conical; body compressed and tapering into a point. The mouth is deeply cleft, the jaws being equal, its gape nearly horizontal, and its angle extending considerably beyond the orbit. The maxillar teeth are slender and acute, canine-like, larger anteriorly than posteriorly; a series of short sub-conical ones may be observed upon the middle of the vomer. The eyes are sub-elliptical and of moderate development.

The posterior nostrils, which are also the largest, are situated above the orbits on a line drawn in advance of the pupil; the anterior nostrils being tubular, situated near the apex of the snout and directed forwards. Small mucous pores may be observed on the upper surface as well as on the sides of the head. The dorsal fin commences anterior to the branchial apertures, which are sub-circular and rather small. The vent is placed anterior to the middle of the total length, where the anal fin is reduced to a mere membranous ridge. The scales are so minute and imperceptible that the body appears as though perfectly smooth. The lateral line is likewise inconspicuous.

The ground color is reddish brown, darker above than below, with whitish dots scattered all over the body and fins; the dorsal fin is black, margined with a series of black spots; the anal being entirely black or purplish black.

Plate XLI represents *Neomuraena nigromarginata*, size of life. The outlines beneath the main figure are transverse sections of the body and tail.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
860	1	St. Joseph's island, Texas...	1853	Gust. Würdemann.....	Alcoholic.	Gust. Würdemann.....

NEOCONGER, Girard.

Gen. Char.—Pectoral fins present; dorsal and anal fins mostly reduced to a membranous ridge, uniting with the caudal, where they are better developed. Snout tapering; lower jaw shorter than the upper; maxillar teeth exiguous, disposed upon multiple series. A patch of similar teeth on the front of the vomer, and one series along its median line. Gill apertures lateral, rather large and vertical.

NEOCONGER MUCRONATUS, Grd.

Spec Char.—The largest specimens observed are about twelve inches in total length. The head is small, slender, narrow, and pointed; the upper jaw projecting beyond the lower. The gape of the mouth is horizontal, its angles extending beyond the orbits. The eyes are very small, sub-elliptical.

The posterior nasal aperture is placed near the anterior rim of the orbit, whilst the anterior one is situated on the side and near the apex of the rostrum. The vent is situated somewhat nearer the extremity of the snout than the posterior edge of the caudal fin. The dorsal fin commences a little way in advance of the vent, and, like the anal fin, it constitutes a mere membranous ridge until about an inch and a half from the posterior extremity of the body, where it expands, fin-like, and unites with the anal. The pectorals are small, sub-elliptical in their outline, and broad at their base.

The color is dark reddish brown above; light reddish or dull white beneath.

List of specimens.

Catal. No.	No. of spec.	Locality.	When collected.	Whence obtained.	Nature of specimen.	Collected by—
861	5	St. Joseph's island, Texas...	1853	Gust. Würdemann.....	Alcoholic.	Gust. Würdemann.....

LIST OF THE PLATES.

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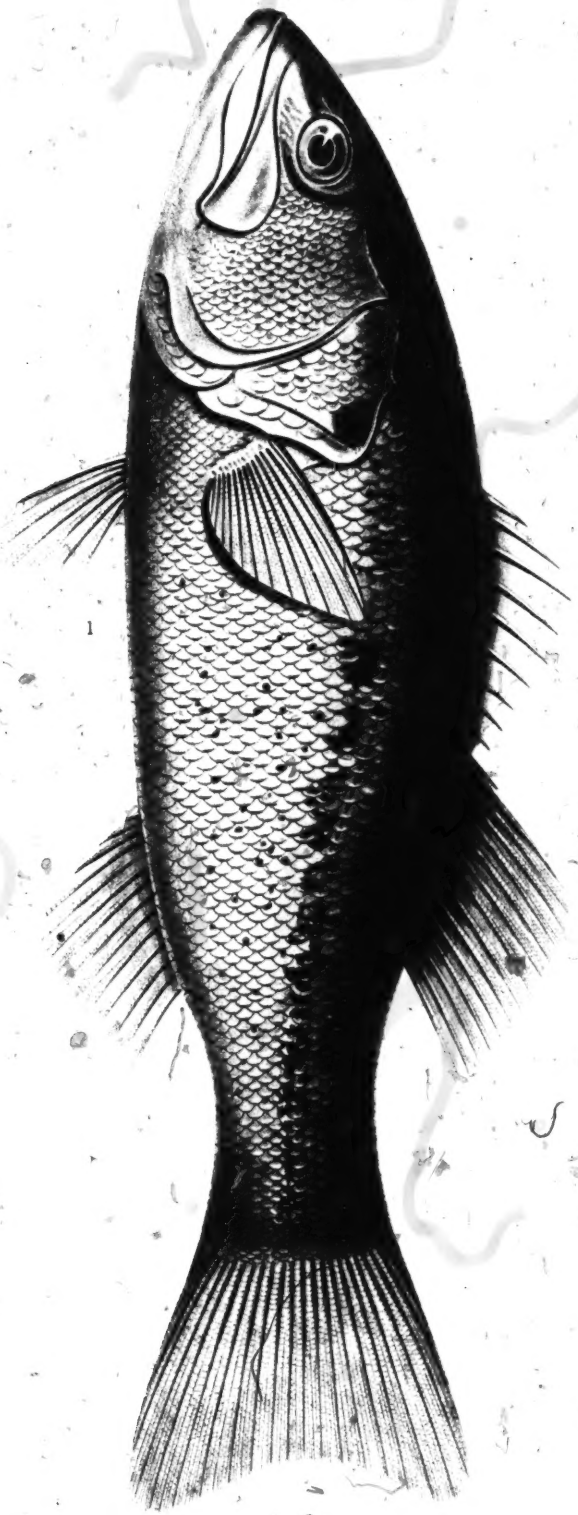

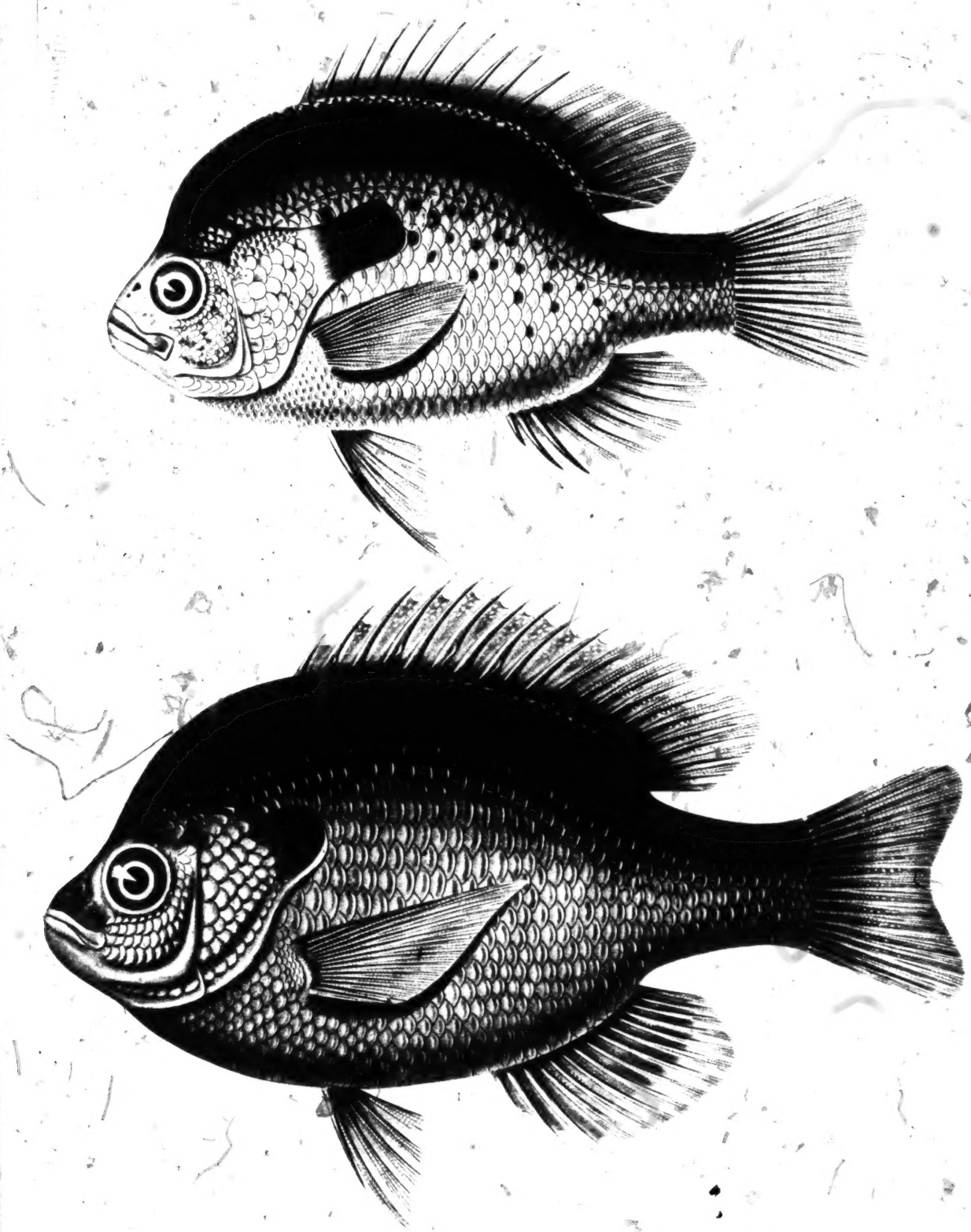

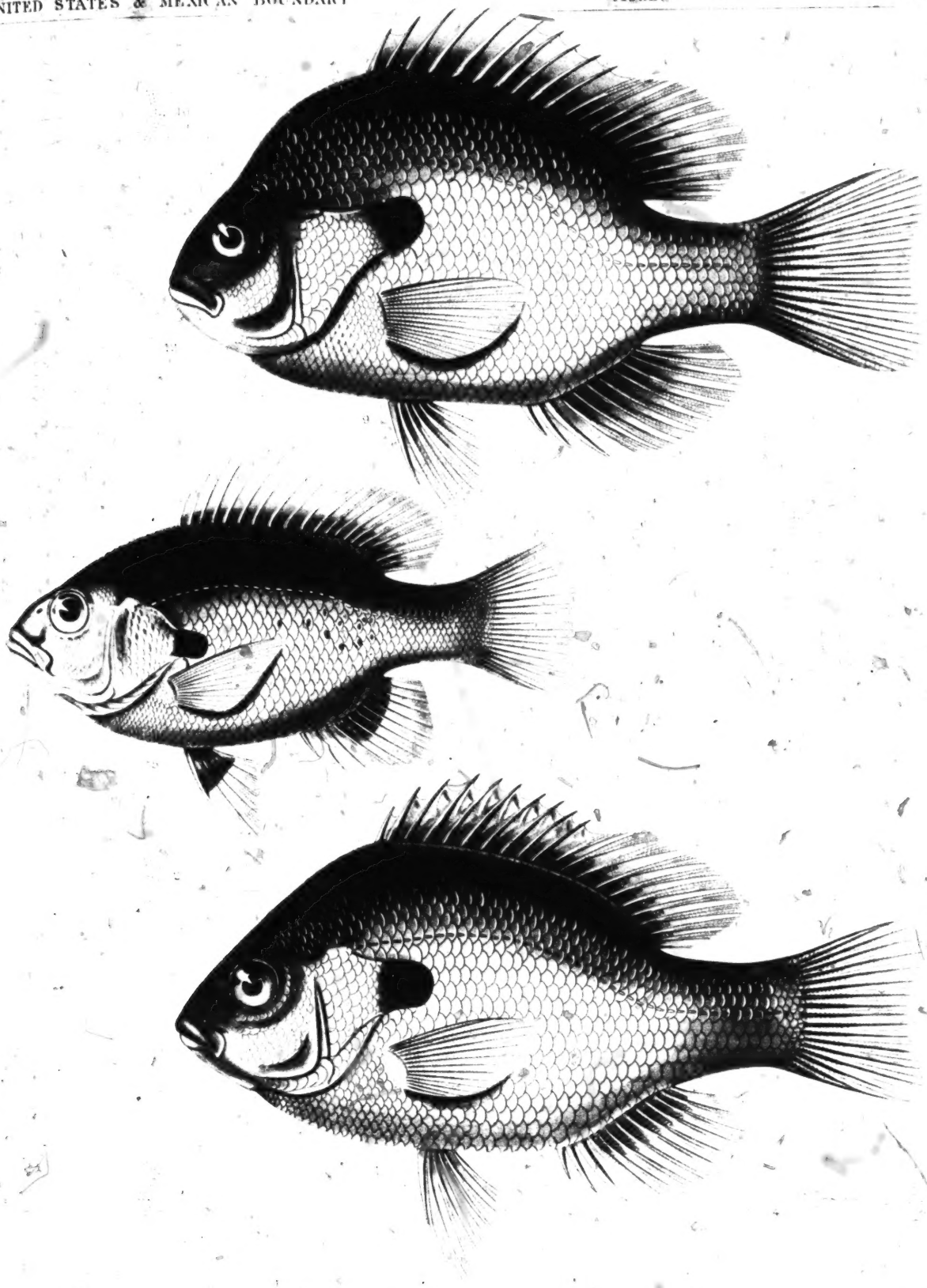

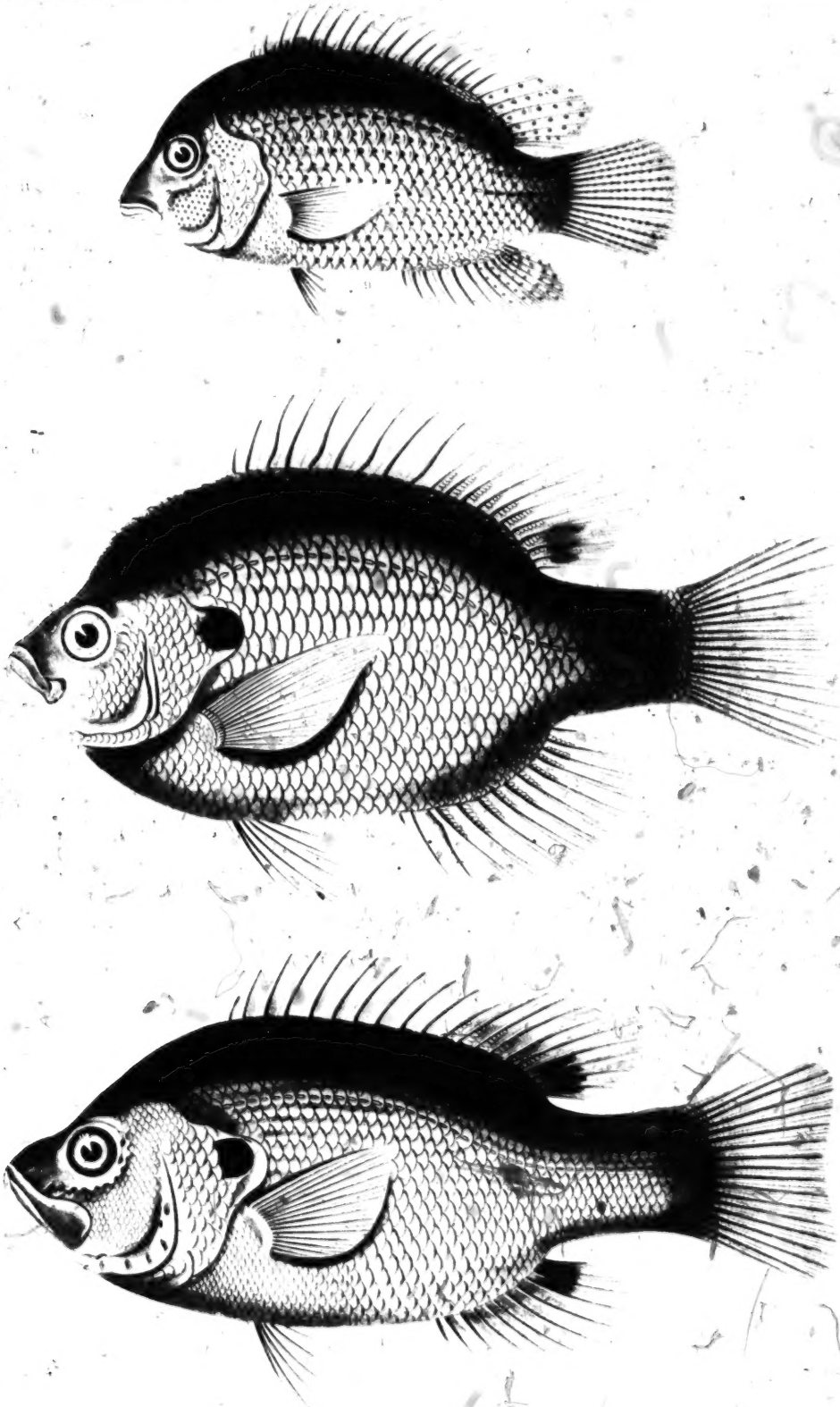

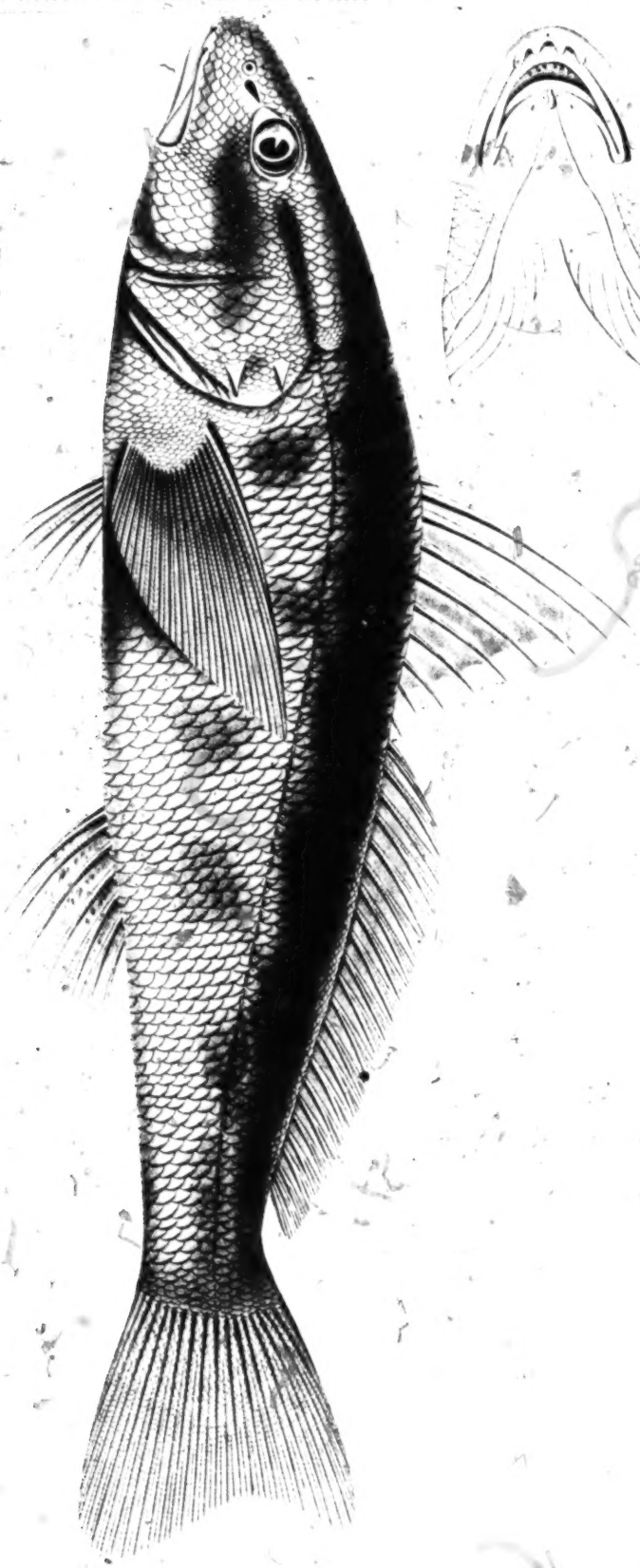

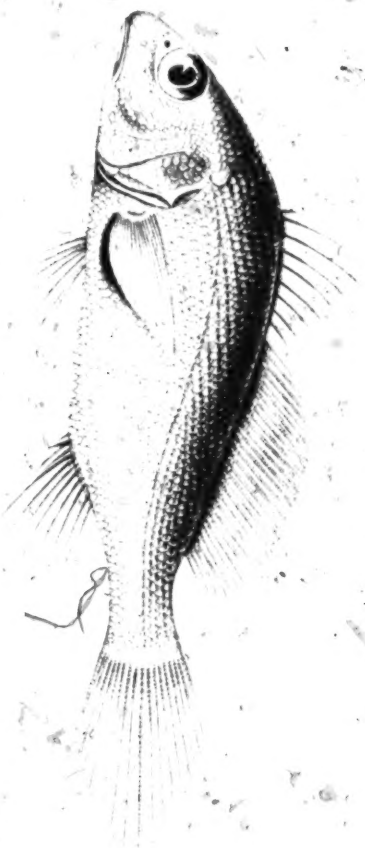

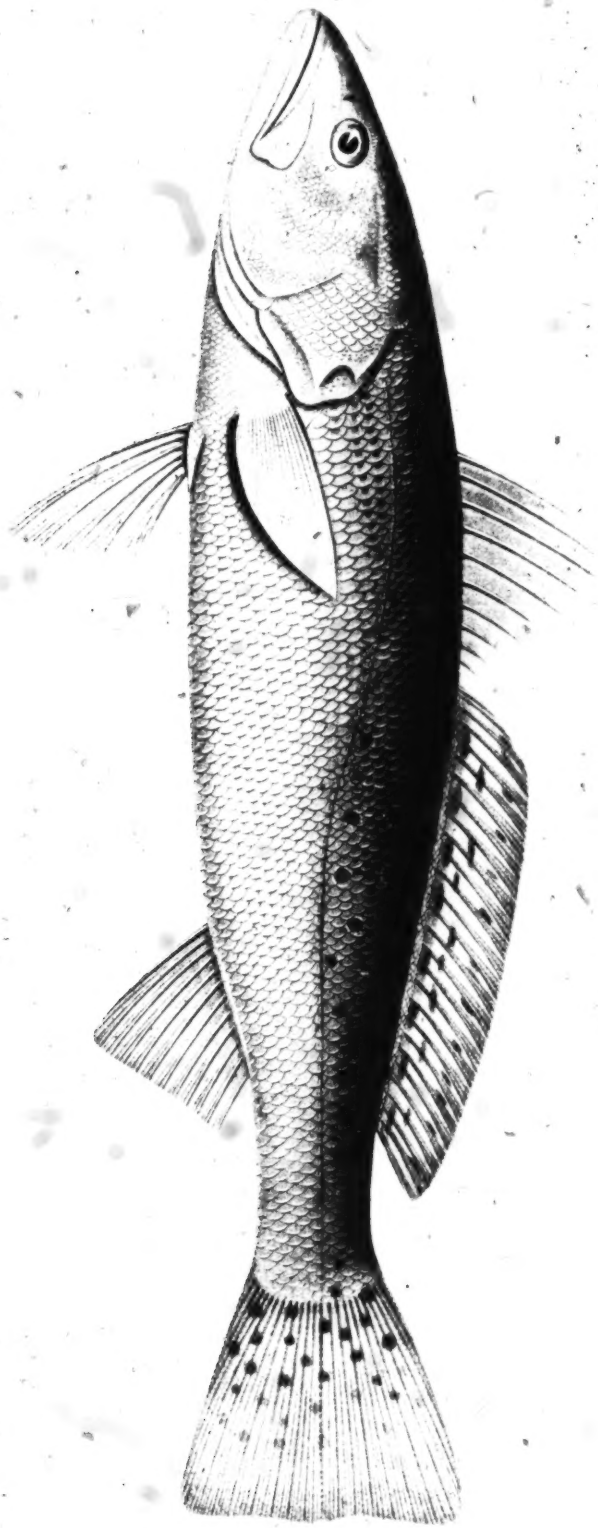

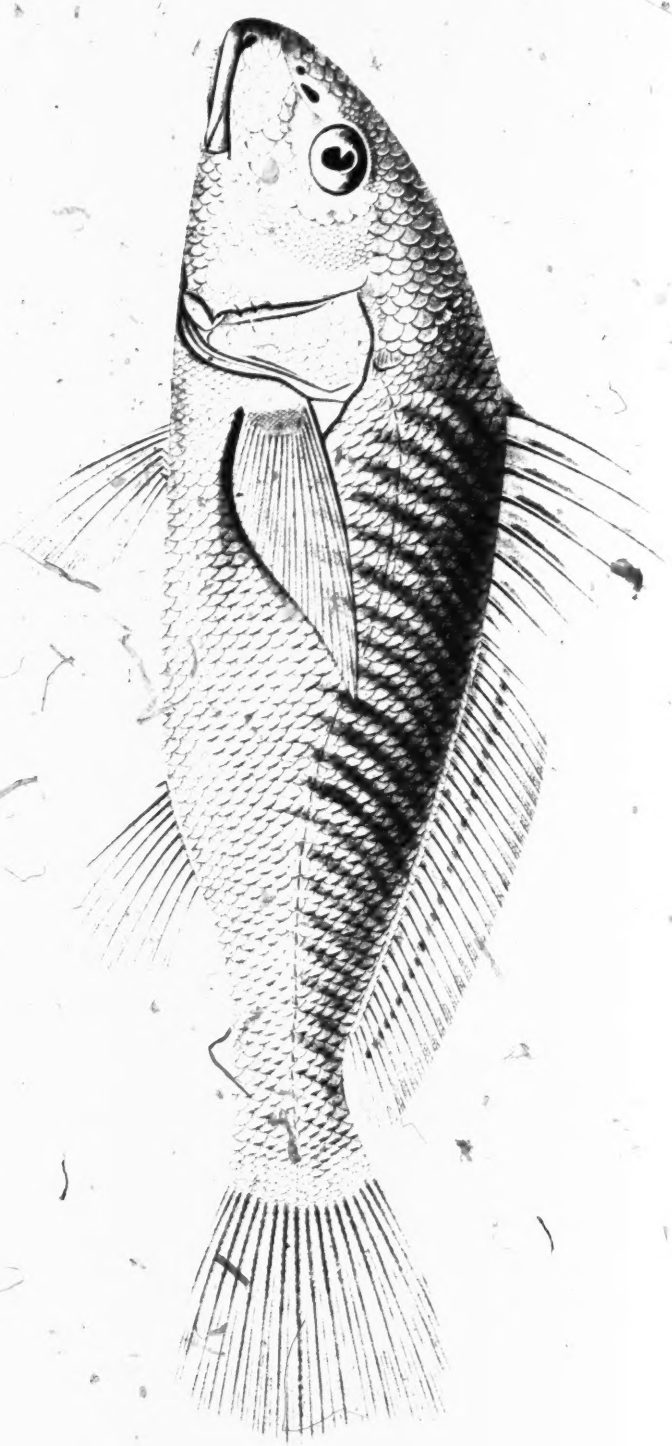

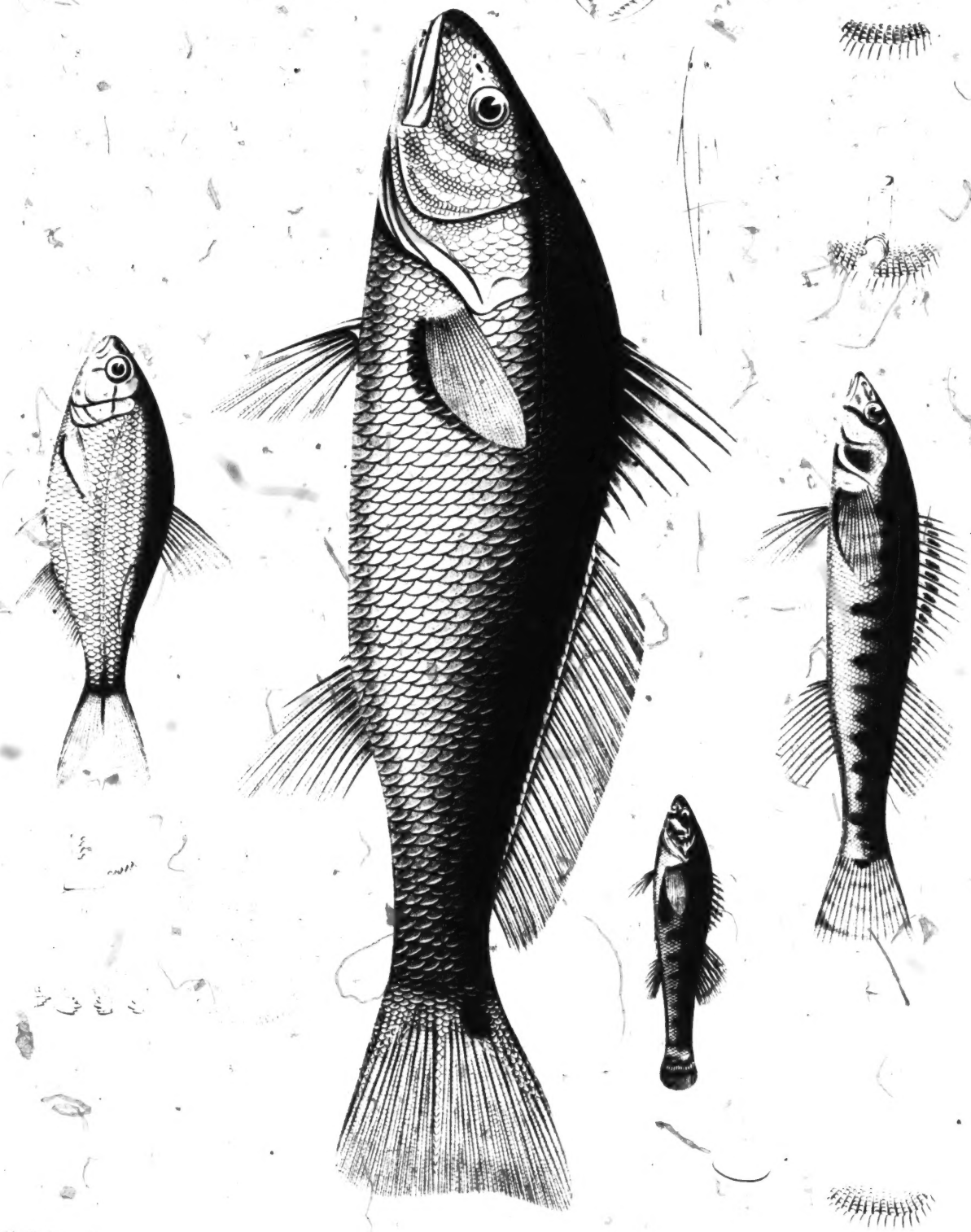

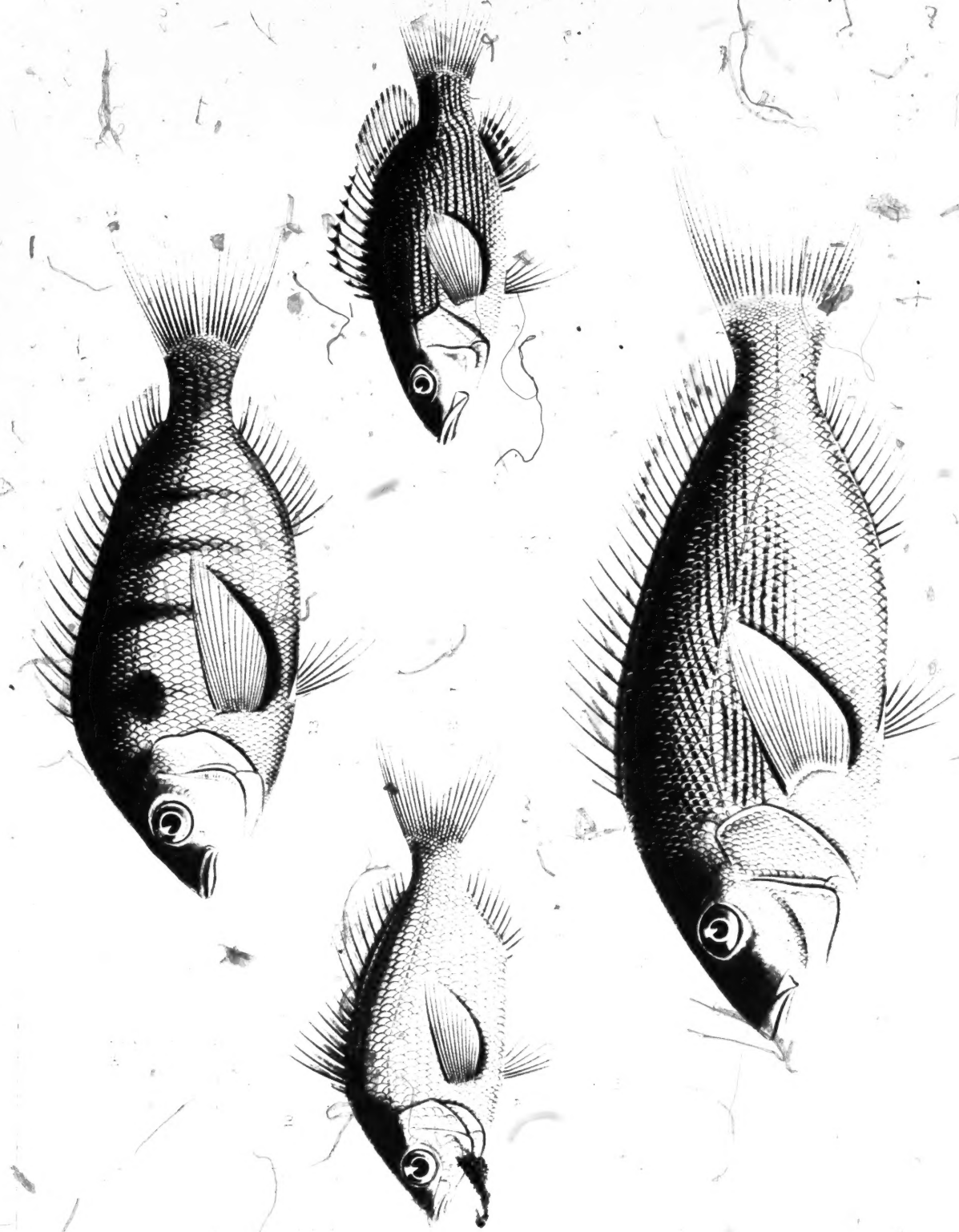

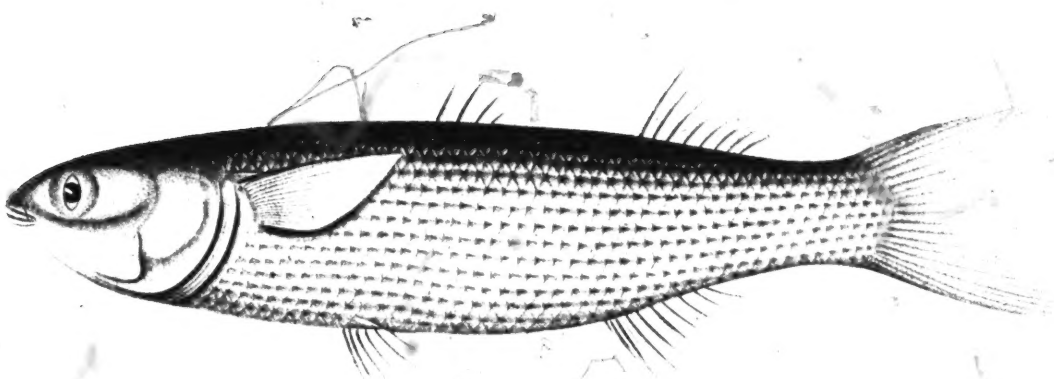

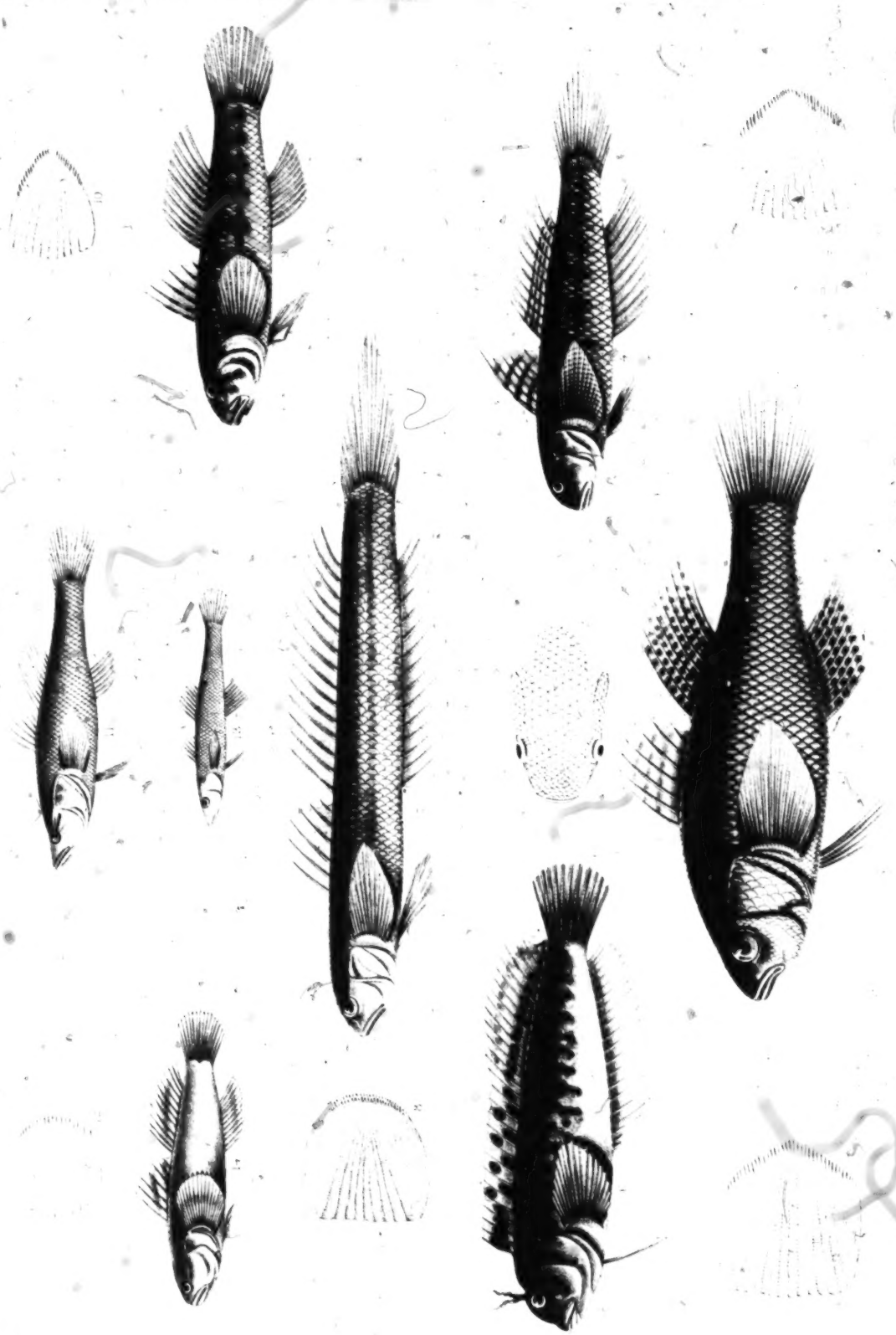

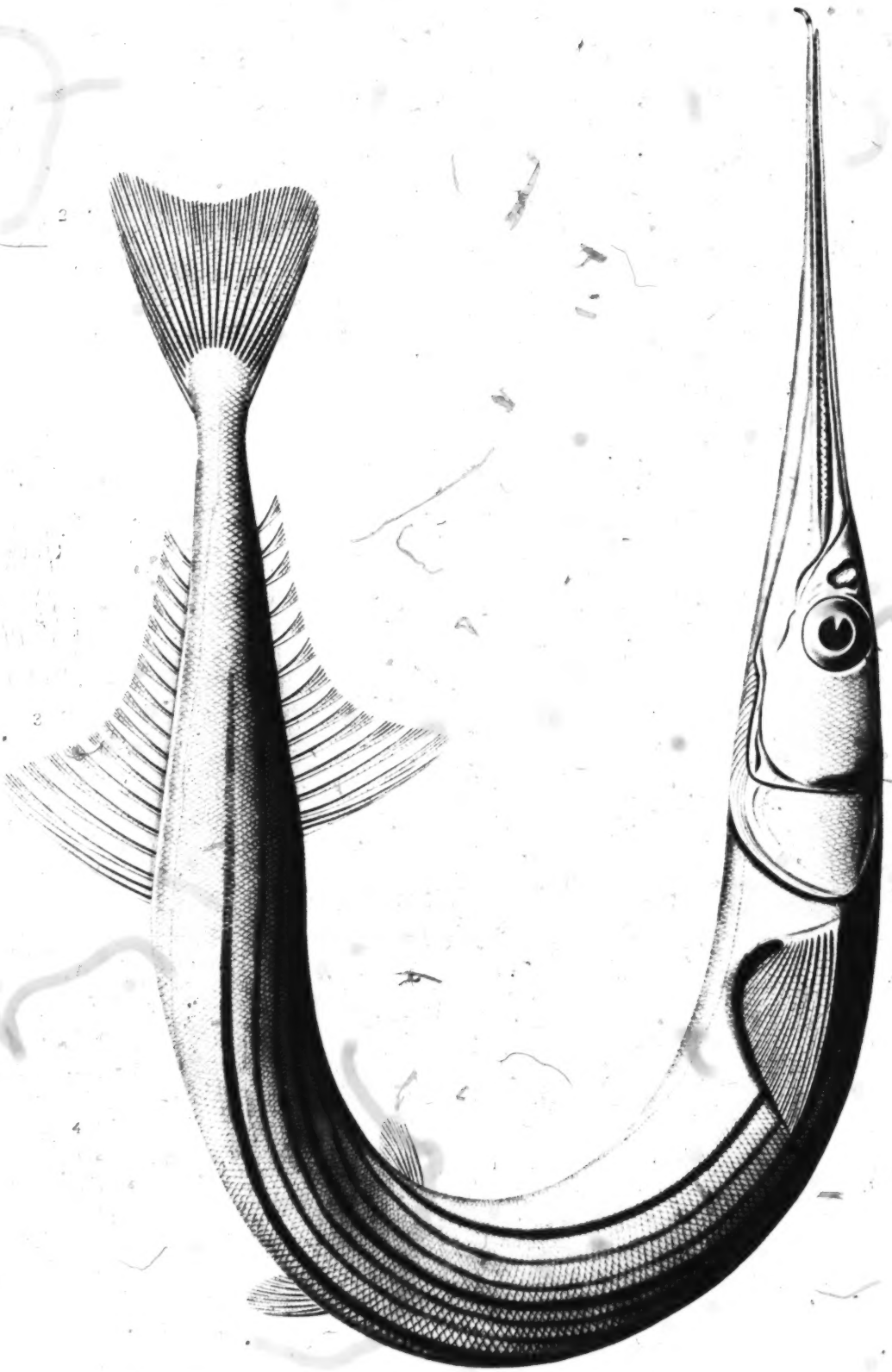

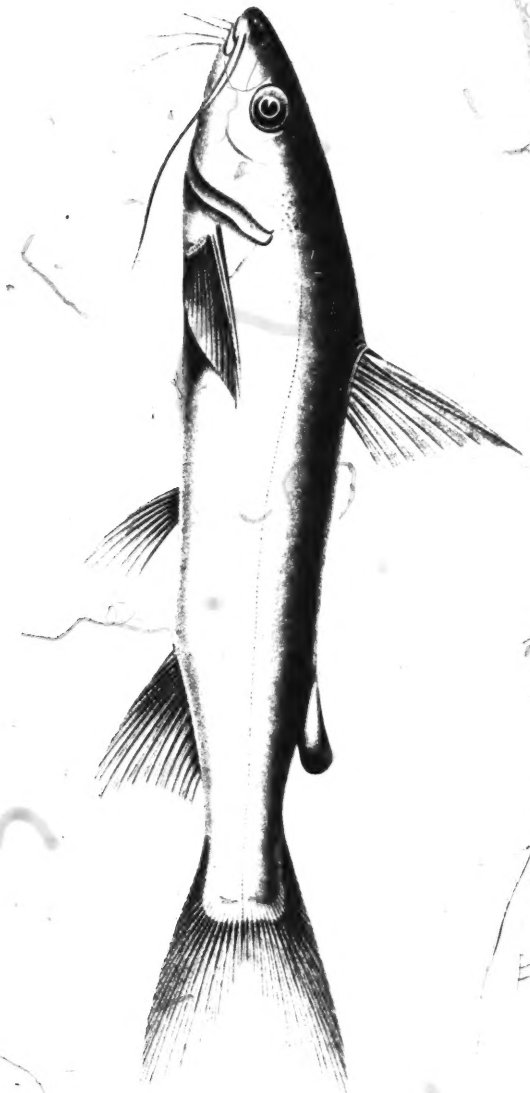

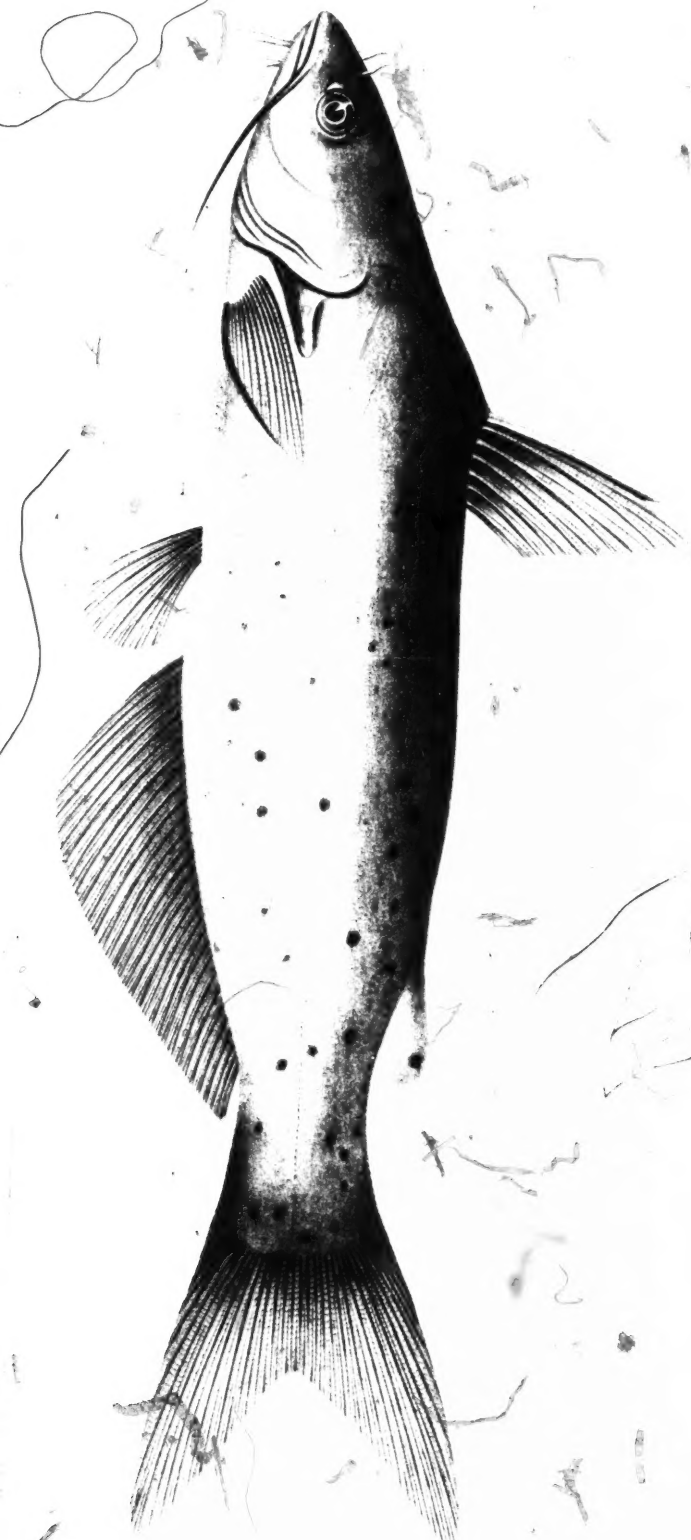

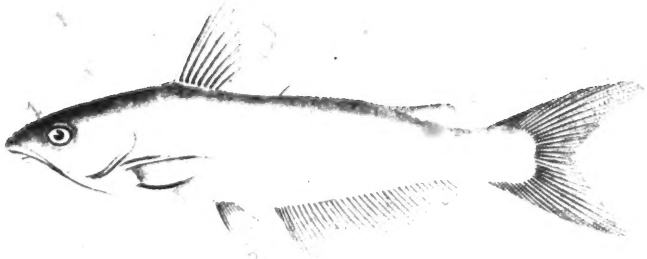

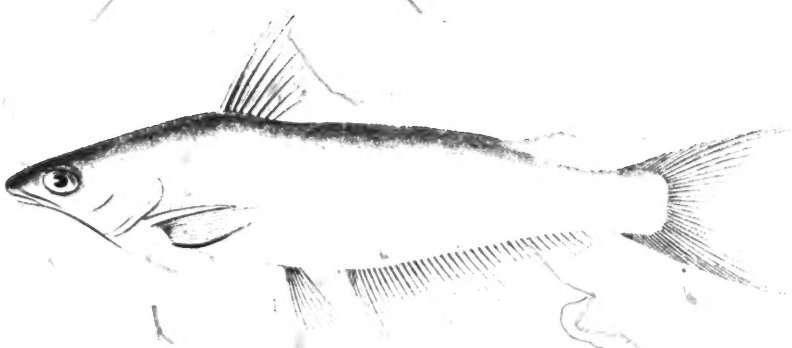

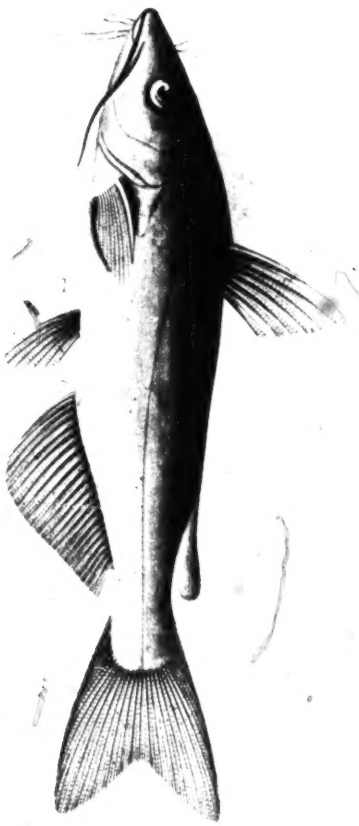
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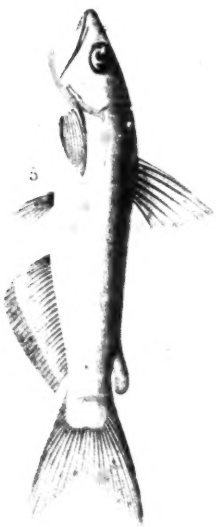
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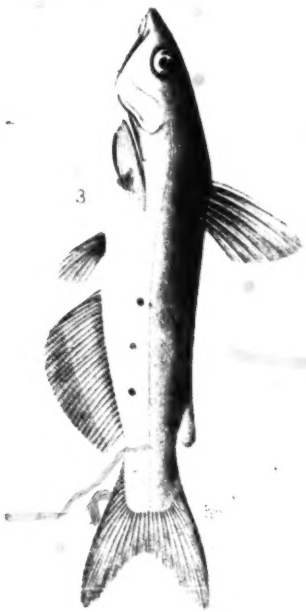
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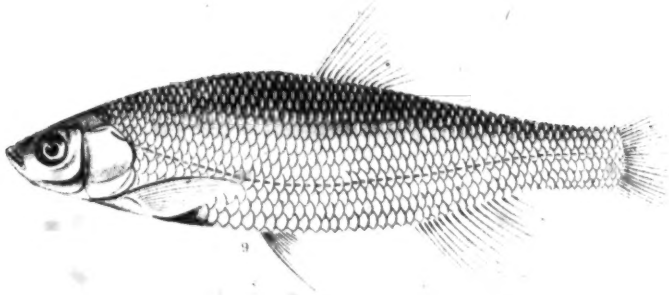

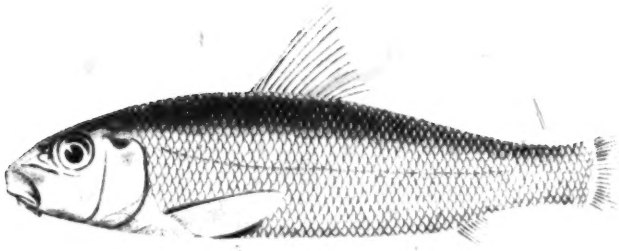

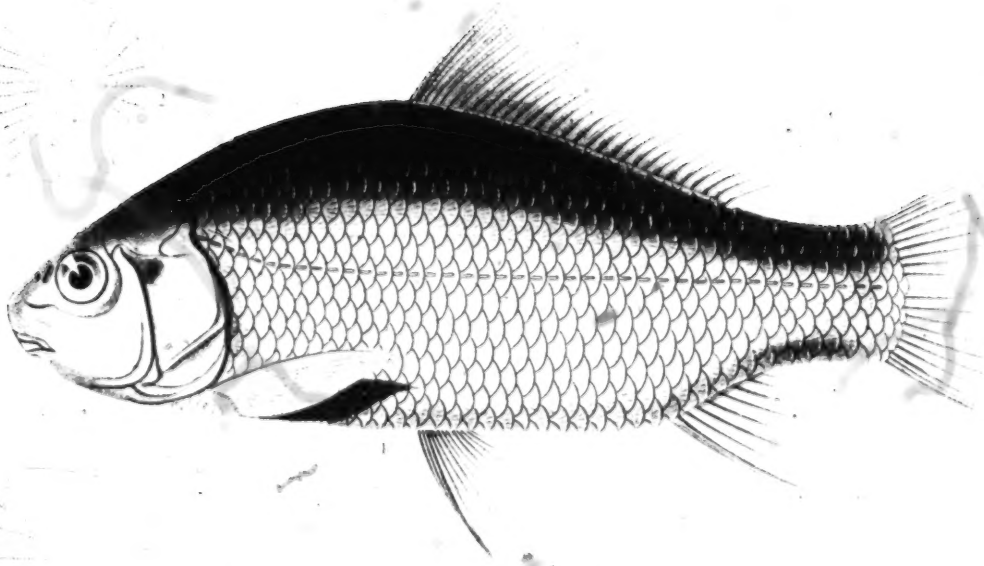

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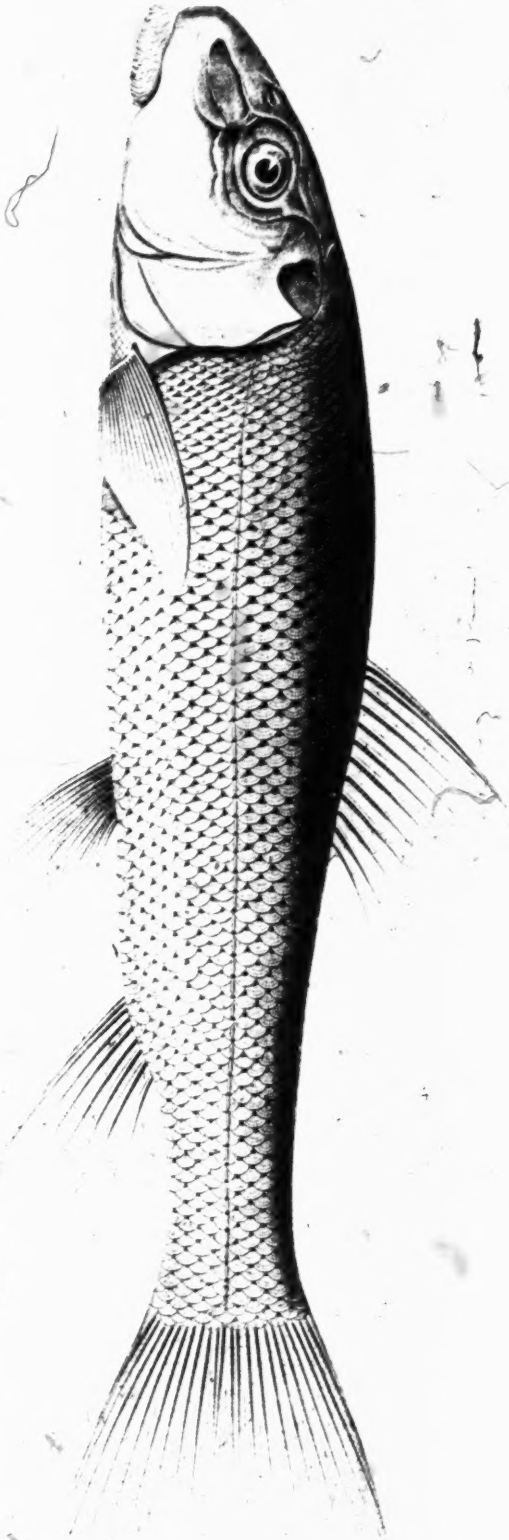

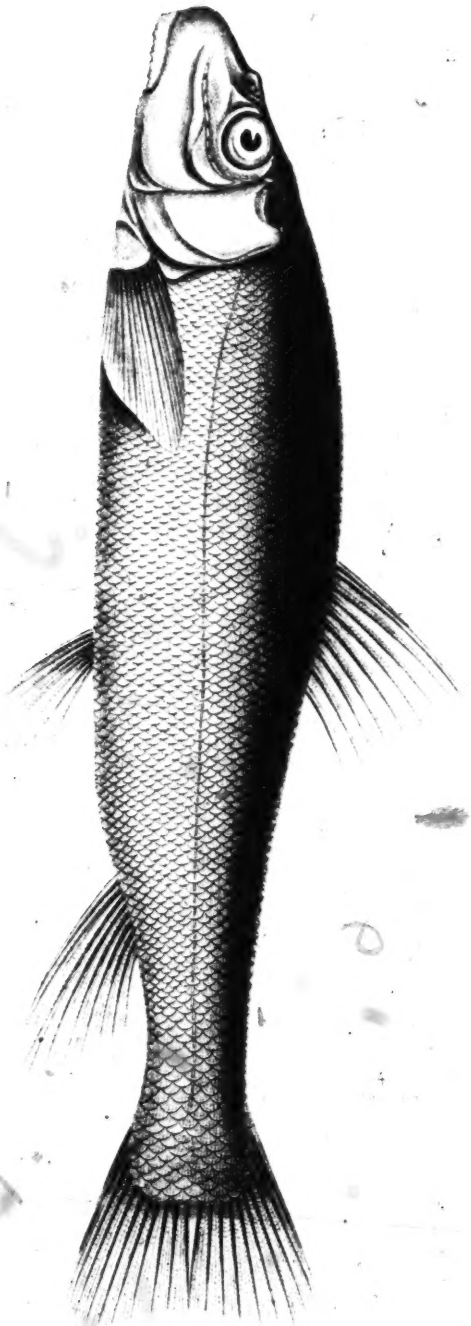

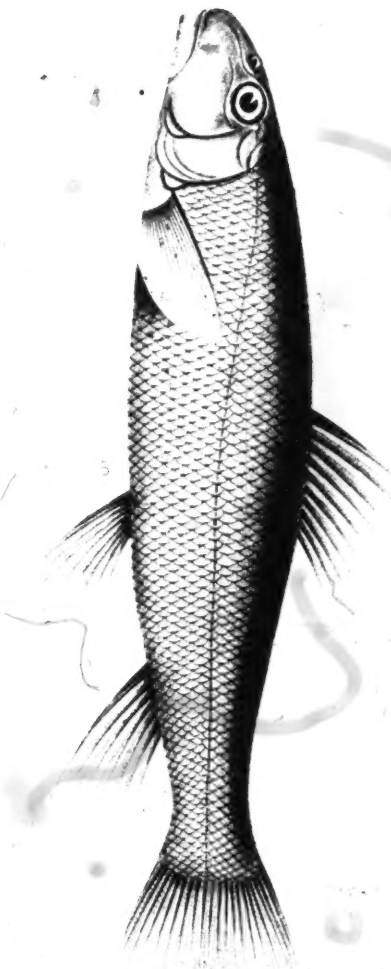

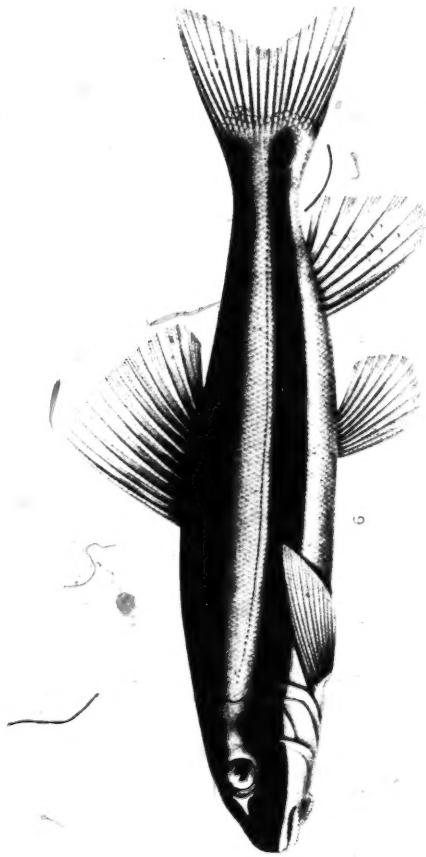

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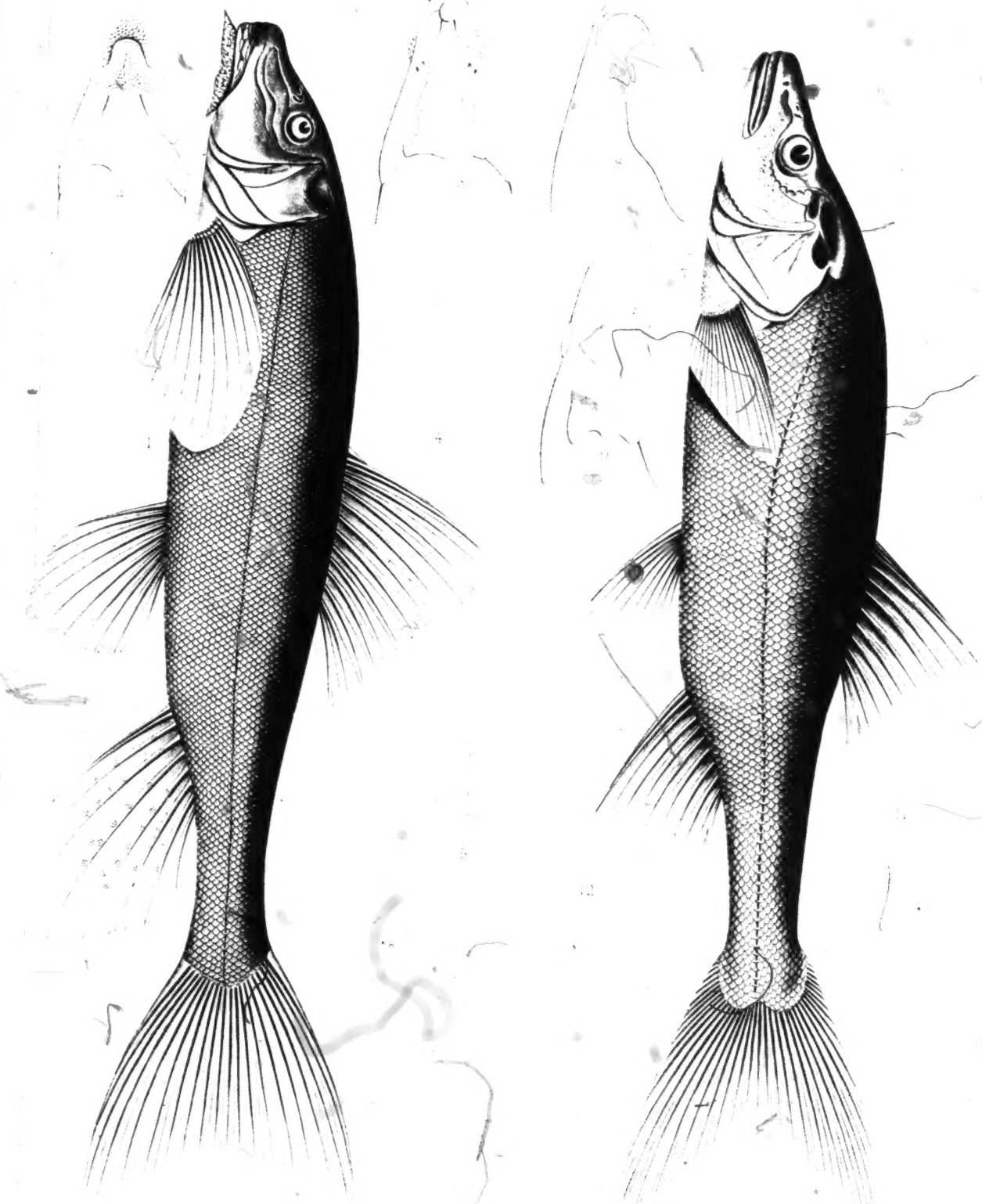

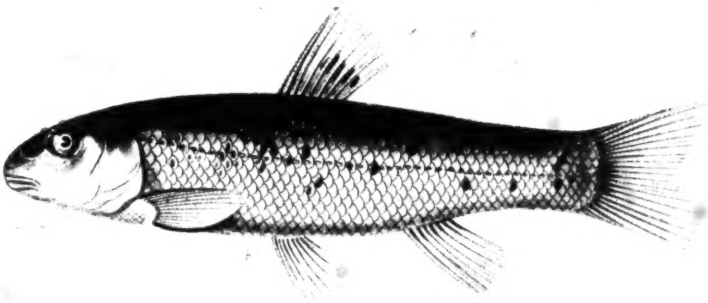

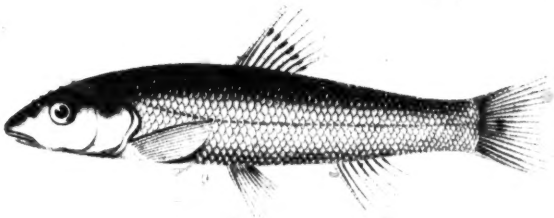

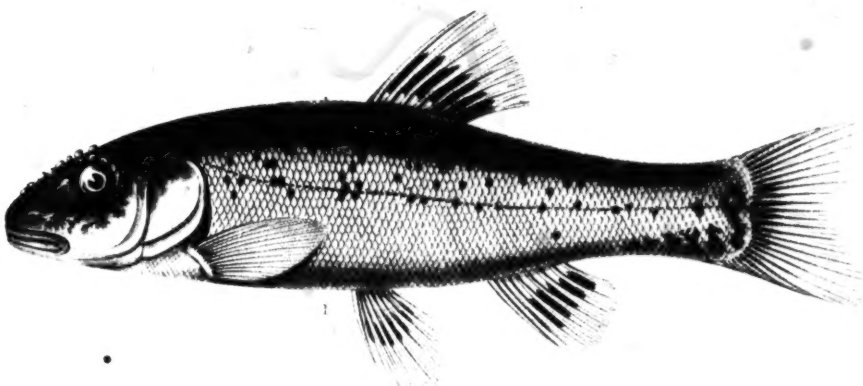

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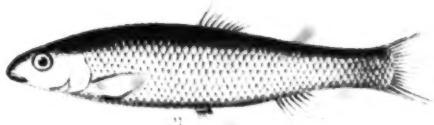

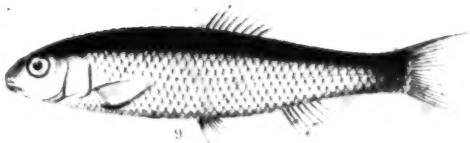

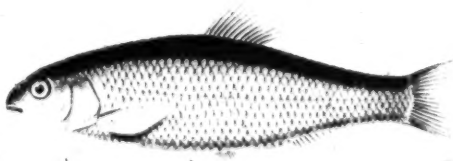

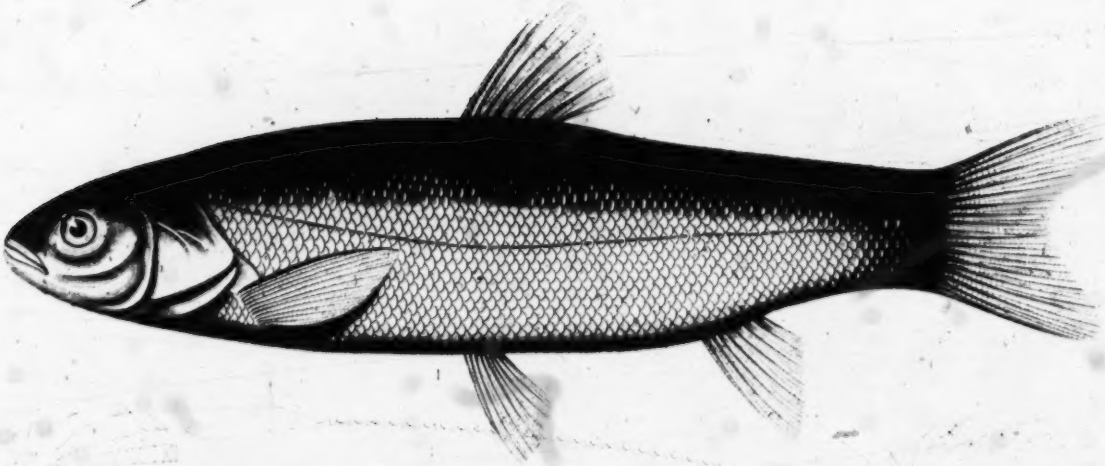

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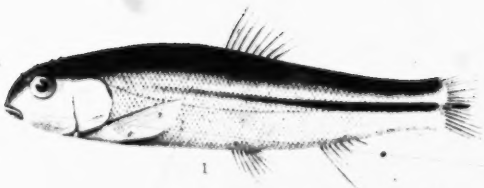

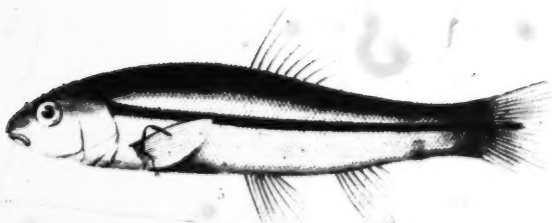

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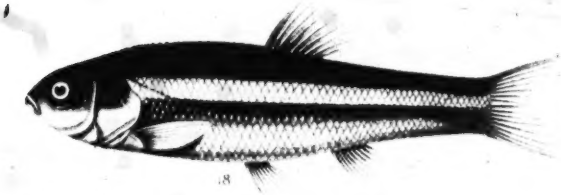

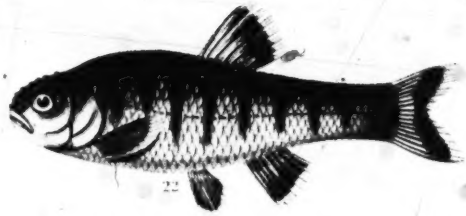

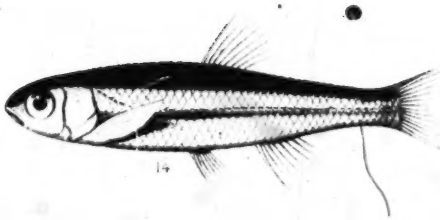

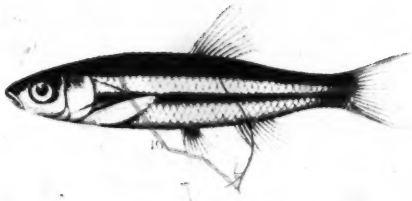

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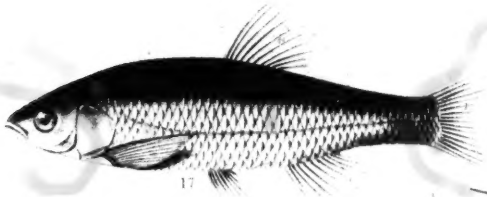

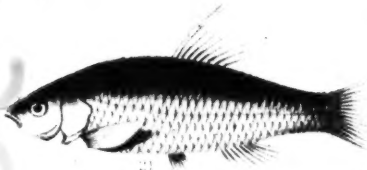

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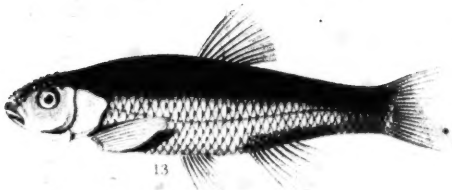

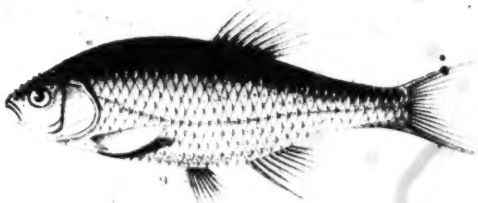

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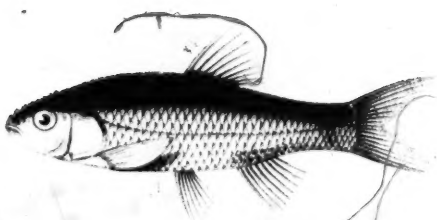

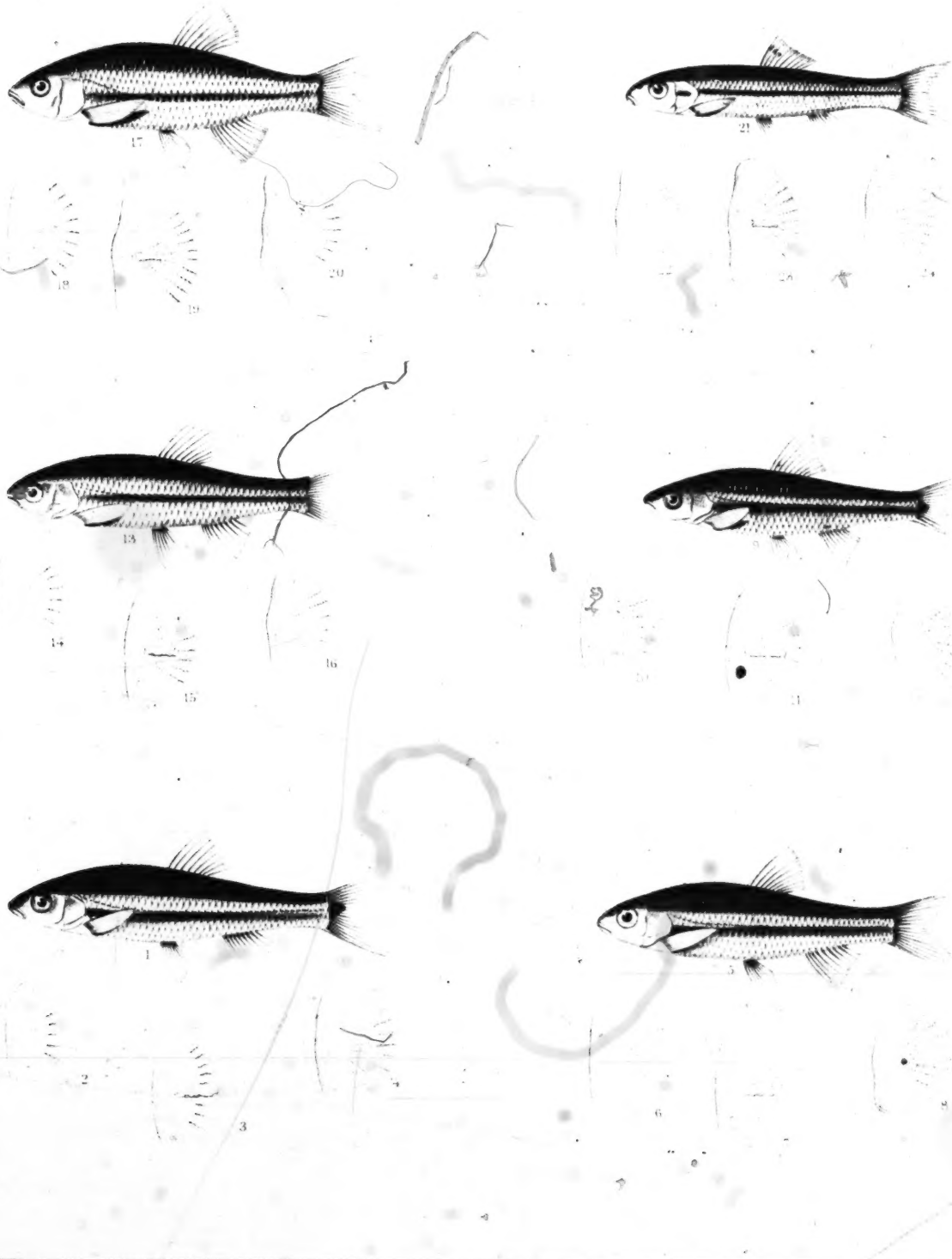

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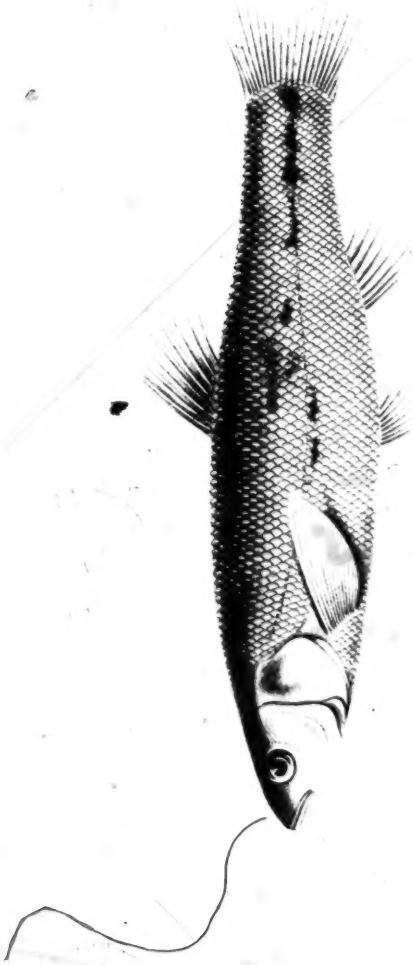

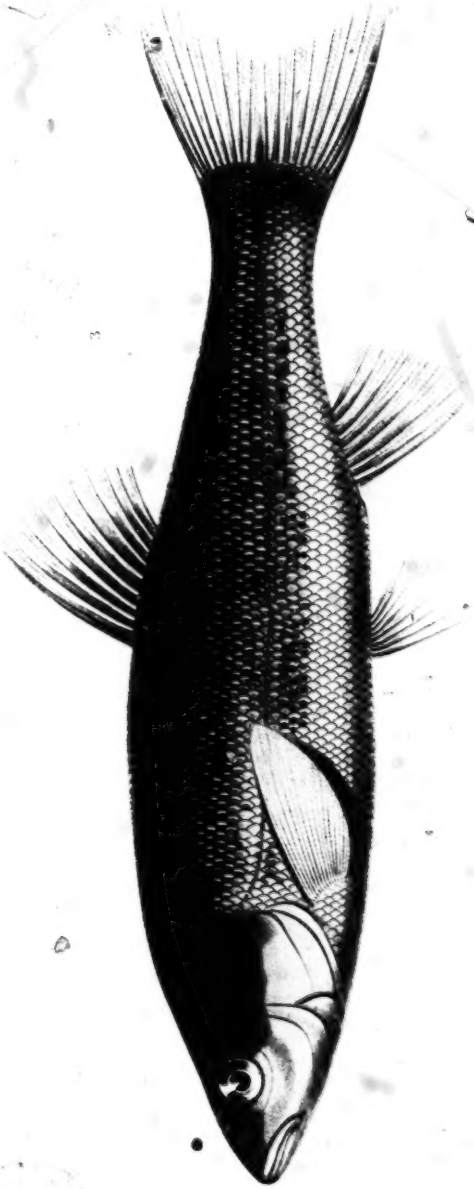

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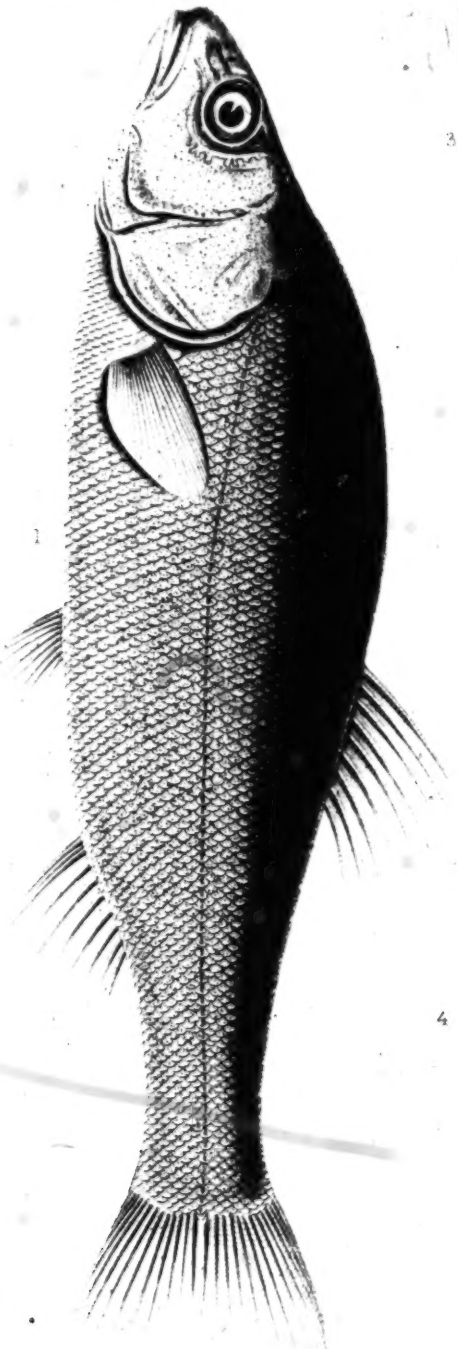

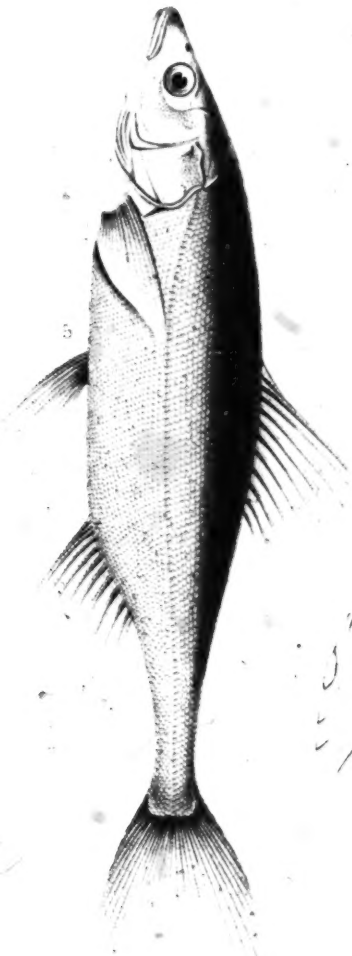

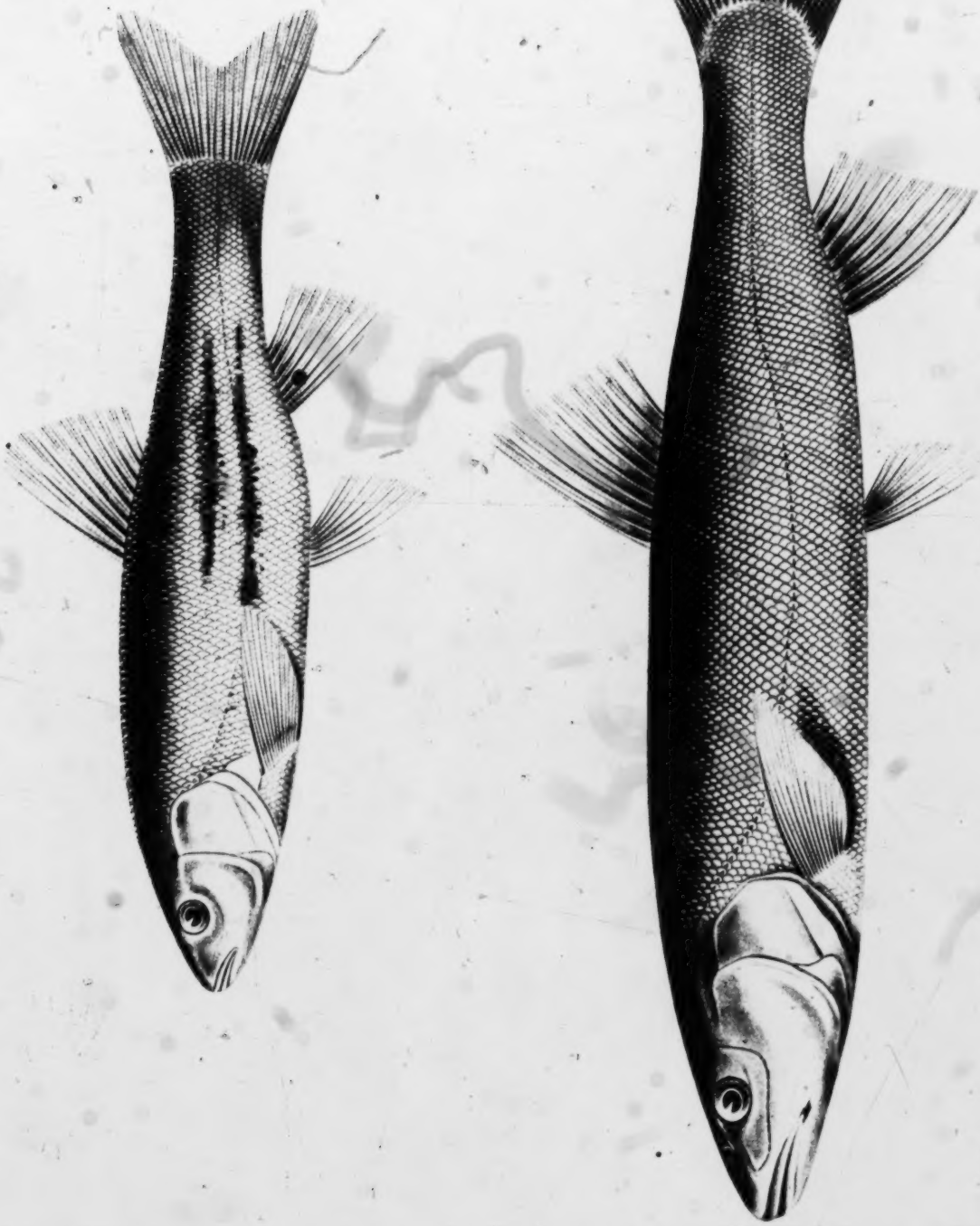

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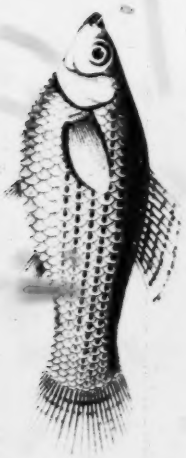

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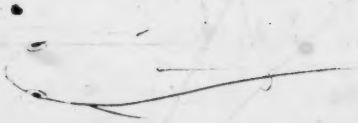

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